

INTERNATIONAL UNION AGAINST TUBERCULOSIS.

Committee for After-Care and Rehabilitation.

AFTER-CARE AND REHABILITATION

Principles and practice

by E. BRIEGER

Printed at the Pendragon Press, Cambridge.

PREFACE.

This brief study surveys the methods adopted by the medical profession in a difficult field of social medicine. Progress in this field will depend upon the forging of a link with industrial medicine—itself in a process of readaptation.

The various aspects of social medicine cannot be separated. They form an organic whole. The years that lie ahead will see great progress in the development of co-operation with industry ; and in this way there is no doubt that the ultimate solution of many grave problems of after-care will be found.

PENDRILL VARRIER-JONES.

INTERNATIONAL UNION AGAINST DISEASES

Organ of the League of Nations

ARTICLE-CASE AND REHABILITATION

Published by the League of Nations

Geneva, 1920

THE JOURNAL OF
THE INTERNATIONAL UNION AGAINST DISEASES
AND THE
THE JOURNAL OF
THE INTERNATIONAL UNION AGAINST DISEASES
AND THE
THE JOURNAL OF
THE INTERNATIONAL UNION AGAINST DISEASES
AND THE

Printed by

The League of Nations, Geneva, 1920

Published by the League of Nations

Geneva, 1920



TABLE OF CONTENTS.

PREFACE	PAGE
INTRODUCTION	4
PART I. PROGNOSIS AND AFTER-CARE	7
Chapter 1.—Changes in prognosis of pulmonary tuberculosis. - -	10
Statistical evidence of the influence of treatment, environment and other factors on case mortality.	10
Sanatorium treatment and survival.	10
Pneumothorax treatment and survival.	11
Immediate results of combined intensive treatment.	12
Environment and life expectancy.	15
Change in the epidemiological type.	18
Statistical evidence of the increase of survival rate in consecutive year-groups.	19
Survival-rate in pre-sanatorium period and down to 1920.	19
Survival-rate since 1920 in consecutive year groups.	21
Follow-up statistics of County Councils and Municipalities.	22
Follow-up statistics of Sanatoria.	24
Chapter 2.—Significance of the increase of the survival-rate. - -	34
After-histories	34
of the + - case.	37
of the ++ case.	
Analysis of follow-up statistics of consecutive year-groups with a view to prognosis.	39
Position in 1920-1927.	40
Change from 1921/25 to 1930/32 according to the Bilthoven statistics.	42
Chapter 3.—The three functions of after-care - - - - -	47
The social-hygienic and sociological function.	48
The social-therapeutic function.	49
A Social-therapeutic index.	49
Conclusions.	50
Appendix - - - - -	51
PART II. SOCIAL REHABILITATION - - - - -	52
Chapter 1.—The tuberculous as wage-earner - - - - -	52
Chapter 2.—Working and earning capacity and industrial research - -	58
Working capacity tests.	59
Prognosis of working capacity.	60
Response to work.	61
Efficiency test.	62
Ability test.	65
Chapter 3.—The economic value (Realwert) of the tuberculous sub-standard worker.	67
Chapter 4.—Social readjustment - - - - -	69
Industrial convalescence.	69
Re-employment.	71
Placement of arrested cases.	71
Sheltered employment and segregation of the bad chronic cases.	72
Re-employment of the good chronic cases.	74
Chapter 5.—Sheltered Industries. - - - - -	77
Chapter 6.—Costs to community. - - - - -	84

PART III. THE MULTIPLE UNIT FOR INSTITUTIONAL CARE AND AFTER-CARE -	86
Chapter 1.—Preliminary experiments - - - - -	86
The Edinburgh Scheme.	86
The extension of sanatorium treatment through occupational therapy.	86
Training colonies :	87
Southfield Farm Colony.	88
Tomahawk Lake State Camp.	88
Hairmyres Colony.	88
Colonies :	89
Kinson Farm Colony.	89
Campagne-les-Bains.	89
Garden Cities for the Tuberculous.	90
Institutional After-Care :	90
Eudowood Farm Colony.	90
Rutland State Sanatorium.	91
The Factory Sanatorium Scheme.	91
Summary - - - - -	92
Chapter 2.—Reorganisation of institutional care and after-care.	93
Chapter 3.—Types of departmental institutions.	95
Sanatorial Schemes : The Bilthoven-Scheme.	95
Post-sanatorial type :	97
Zonnestraal.	97
Pott's Memorial Hospital.	98
Appisberg-Maennedorf.	101
Sanatorium-Hospital type :	103
The Herrnpotsch Scheme.	103
Various Attempts :	105
Wrenbury Hall.	105
Cottage Scheme.	105
Olive View Camp.	106
Central New England Scheme.	106
Sanatorium Magnanville.	107
Sanatorium du Vion.	107
Zonlichtheide, Maria Oordt, Gennep.	107
Peamount Sanatorium.	108
Military Sanatorium, Montana.	108
Sanatorium Boarding Schools :	109
Colonie Franco-Britannique.	110
Burrow Hill, Frimley.	110
University Sanatoria.	111
Ecole de Réadaptation au Travail Marcinelle	111
Scuola Professionale Camerlata, Como.	112
Principles of sanatorial schemes.	112
Urban Workshops :	113
Altro Workshop.	113
Spero Workshop.	115
Boston Workshop.	115
Principles of Urban Workshops.	116
Sanatorial village settlements :	117
The Papworth Scheme.	117
Preston Hall Sanatorium Colony.	121
Barrowmore Hall Sanatorium Colony.	124
The Ministry of Health on Village Settlements.	124
Local Authorities and Village Settlements.	125
Health City "Clairvivre," Dordogne.	127
Conclusions - - - - -	130

INTRODUCTION.

In the fight against tuberculosis, the highest measure of success can be attained only when three fundamental aspects of the work, care (dispensaries), treatment (sanatoria) and after-care, are so organised that harmonious co-operation between them is secured. This almost appears self evident, but fundamental differences in the attitude of individuals and authorities towards tuberculosis problems result in the existence of a very divided opinion on the relative importance of the separate components of this tripartite campaign.

At the beginning of the century the provision of as many sanatoria beds as possible was regarded as the logical solution ; but experience soon showed that although treatment was an extremely important factor it was not in itself sufficient. The establishment and growth of dispensaries with their many-sided activities followed as a matter of course. But in spite of this and of constant improvement in therapeutic methods, the ultimate results, except for what may be called the minimal cases, remained unsatisfactory. Finally attempts were made by the institution of suitable after-care organisation, both to maintain or improve the measure of health gained during the period of treatment ; and to provide accommodation for the permanently disabled whose wage-earning capacity was partially or wholly lost.

It is typical of the whole development of the fight against tuberculosis that in the first instance, with few exceptions, each of the above mentioned departments developed independently of the others and sought to maintain its independence. Properly organised co-operation was only attempted much later and even to-day is very far from being complete.

However well organised or highly specialised the individual undertakings may be, there can be no doubt that those which fail to consider the course of the disease in relation to its background of social and economic problems will turn out eventually to be practically useless.

There is still much confusion with regard to the many and varied problems of after-care to whose principles and practical aims this study is devoted because some of the premises and assumptions on which the concepts of these problems are based have been misconceived.

The essential prerequisite for proper after-care is the carrying out of a strict and sufficiently long course of treatment in order to attain the best possible clinical result ; we must emphatically deprecate the view that after-care is in part a substitute for treatment. To obtain the full value of after-care this must be preceded by a period of treatment in which if necessary all the possibilities of therapy are utilised thoroughly in an endeavour to attain a favourable clinical result.

The functions of after-care are (1) the provision of work, carefully apportioned to maintain the condition of health achieved by sanatorium treatment, and (2) the creation of conditions which will assure to those of full working capacity who have returned to normal work the maintenance of their recovered health, (3) the provision of an environment suited to their substandard life for those whose working capacity is permanently reduced, either in the open labour market or as settlers in a work colony.

Naturally the needs of cases vary widely. Those with minimal non-bacillary pulmonary lesions or glandular trouble which are quickly and permanently healed are in less need of after-care. They can as a rule, without long training, return to normal economic life, their provision being taken over by the dispensaries. More serious cases, and especially the open cases which form the majority of sanatorium inmates require well organised after-care. Here the transition from treatment to training must be carried out with the utmost circumspection and each individual treated on his merits. Treatment is designed to convert the sputum positive case into a negative and once the aim of treatment to convert 'open' into 'closed' cases has been reached it is the function of after-care to maintain this condition without, however, neglecting the chronic cases who have failed to respond satisfactorily to treatment and whose sputum remains positive.

Between those two extremes all stages are possible ; and a complete solution of the tuberculosis problem will only be accomplished when the multitudinous requirements of these varied types can be fully and adequately met by the harmonious combination of sanatorium, dispensary and after-care service.

ERNST BACHMANN.

ACKNOWLEDGEMENTS.

The original programme of this monograph presented to the Union's Conference at Warsaw three years ago has been modified in several ways. Work began on a survey of the whole question ; but it became apparent at an early stage that there was a real need for the establishment of the principles underlying the problem confronting every public authority in every country.

This monograph is the result of a joint effort to establish these principles, and the working sub-committee held about ten meetings in Paris, Cambridge, Utrecht, Bilthoven and Zurich, where the manuscript in its different phases was discussed. The co-editors of the monograph not only assisted with their wide experience but also contributed most valuable material. The monograph, which shows all the strengths and weaknesses of such co-operative work is a preliminary study indicating the different problems and the way to deal with them. Further detailed reports will be submitted to the Union Internationale contre la Tuberculose in due course.

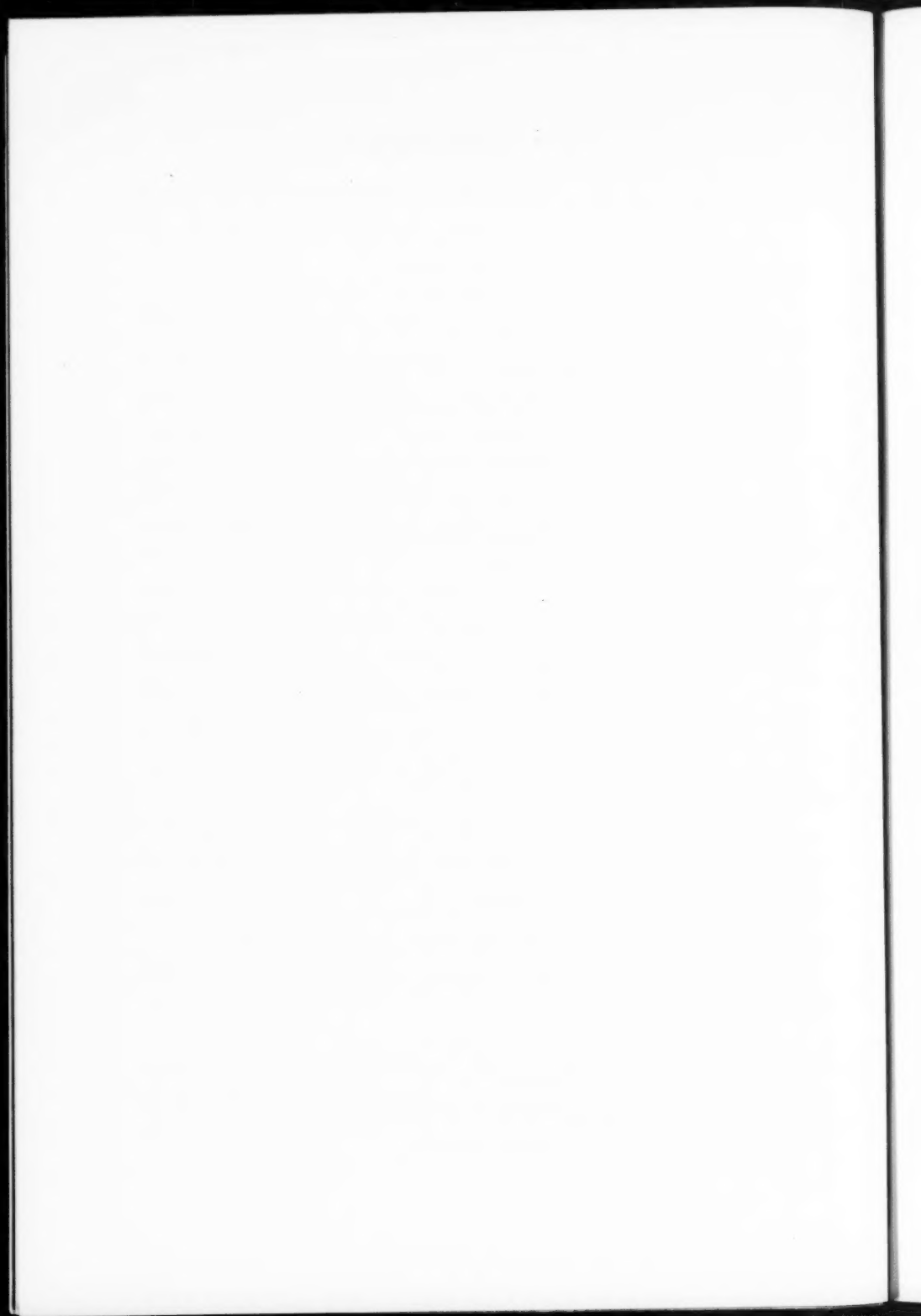
My thanks are due first and foremost to Sir Pendrill Varrier-Jones for his counsel and advice and for the inestimable service he has rendered to the Committee's work by throwing open the resources of Papworth Village Settlement for this work, and to the co-editors, Dr. E. Bachmann, President of the Swiss League against Tuberculosis, and Dr. W. Bronkhorst, Medical Director of the Sanatorium Berg-en-Bosch, Bilthoven, for their active co-operation.

In carrying out this work I have incurred a great debt of gratitude to many authorities in different countries, especially to the Medical Research Council of Great Britain for providing apparatus for industrial research and to the Deutsche Forschungsgemeinschaft who permitted the transfer of some valuable equipment. I am deeply indebted to Sir Arthur MacNalty, Principal Medical Officer of the Ministry of Health, for his sympathetic interest and support, his report on tuberculosis being one of the most important documents on which this monograph is based ; to Dr. J. E. Chapman and Dr. A. Quine of the Ministry of Health ; to Sir Charles Sherrington, who so generously gave me permission to work in his department at Oxford ; to Professor A. V. Hill ; to Sir David Munro, and to Dr. G. P. Crowden of the London School of Hygiene.

My thanks are also due to all those who so kindly assisted by sending detailed reports, or permitting me to use their material, notably, Ishbel, Marchioness of Aberdeen and Temair, Peamount Settlement, Dublin ; Dr. H. A. Pattison and Mr. E. Hochhauser, New York ; Dr. van Lier, Holland ; Dr. Voute, Switzerland ; Professor Dechigi and Professor Bochetti, Italy ; Dr. Forestier, Dr. Hazemann and Dr. Roussel, France ; Sir Percival Horton-Smith Hartley, Dr. R. A. Wingfield, and Dr. V. A. Burrows. I would acknowledge too my deep indebtedness to Mrs. Keynes for her kind reading of the M.S. and the proofs ; to Miss Wood-Legh, Ph.D., and Dr. D. B. Cruickshank for adapting the English text, and particularly to Mr. Peter Fraser, who assisted me in the collection of material, and rendered most valuable secretarial help.

It has been my good fortune to enjoy the guidance of the late Professor J. S. Haldane, who was attracted to this work by his interest in humanitarian problems. It was through his kindness that I was enabled to gain admission to the centre of research in human physiology at Oxford, where I was fortunate enough to work with Dr. C. G. Douglas and Dr. J. G. Priestley, to whom I must offer my most cordial thanks for their numerous kindnesses.

E. B.



PART I.

PROGNOSIS AND AFTER-CARE.

The evolution of the sanatorium system.

The sanatorium-system is still in process of evolution and its different phases are reflected in the after-care movement. After-care has been described by an historian of medicine (Meachen 1) as the "logical outcome of the sanatorium movement." It was the force of facts that gave it birth, and its immediate purpose was the promotion of the complete success of sanatorium treatment.

The foundation of sanatoria for the working man was an experiment of social medicine; but it was from the very beginning an object of sceptical criticism (Koch, Newsholme, Cornet). It was described as a "speculation which the state has sanctioned" (Weickert 2); and the movement was regarded as rather an adventure. It was thought that Brehmer's system would yield the same results even under less favourable circumstances. This expectation was not fulfilled for although the immediate results of sanatorium treatment were promising the classic follow-up statistics of Weickert, Bardswell and Lawrason Brown showed the ultimate results to be unsatisfactory. The after-care movement became a spontaneous reaction to these facts.

This transitional outlook was epitomised by Bardswell (3) when he said in 1906, "It is felt that it should be more generally recognised that in dealing with consumption, sanatorium treatment is only the first step." When the after-care movement was still in its experimental and preliminary stage the problem of how far it was possible for sanatoria to maintain the original form became more and more urgent as the sanatorium system spread. The sanatorium movement fought hard to uphold its principles and these could only be realised by the exercise of an ever increasing discrimination and the restriction of its activities to the treatment of "early cases." As the number of sanatorium beds increased this goal became more and more distant. Indeed, at this stage Brauer said that the best sanatorium was the one which had the worst cases.

For, with the simultaneous growth of the dispensary system, the demands for beds continually increased. The dispensaries, partly because of the necessity of placing the newly notified open cases of tuberculosis under institutional care, became the centres of a large scale movement which made indiscriminate use of sanatoria. Powell (4) quoting a Canadian authority says: "The very foundation of all anti-tuberculosis measures is beds."

The greater the number of tubercle positive cases sent to sanatoria the more evident became the inadequacy of therapeutic methods—a fact confirmed by follow-up statistics. The principal objective of social medicine regarding sanatorium treatment and after-care shifted more and more towards social hygienic control, the institutional segregation of the chronic case, and prophylaxis. The contribution of the sanatorium movement to the decline of general tuberculosis mortality (Drolet)

is now considered to lie only in its provision of institutional segregation (Newsholme). Burnet sums up the results of follow-up statistics thus: "It is possible to obtain a number of individual cures which does the greatest credit to medicine and surgery, while the cure of the social disease is very far from being accomplished (5)".

In spite of the impressive evidence of follow-up statistics the principle of sanatorium treatment has been adhered to unwaveringly in all countries and rightly as the statistics to be given later will show. The follow-up statistics on which the pessimistic view has been based only give information about methods of treatment which may have been superseded at least five years previously or even earlier. The clinician on the other hand judges things according to contemporary technique and therapy. One should not dogmatise on statistics when they seem contrary to actual experience (J. M. Keynes). It is precisely the inadequacy of the results of sanatorium treatment and the progress of therapy which has forced the conclusion that still greater efforts have to be made. The sanatorium movement now not only holds more firmly than ever to its principles but has also greatly expanded its scope. Bezancon advocates the creation of centres of intensified and specialised treatment of tuberculosis. This new feature in the sanatorium system has recently been recorded in the historic discourse of the Academy of Medicine by Sergeant, Léon Bernard and Bezancon.

"Aujourd'hui la face des choses est transformée. Le sanatorium et l'hôpital doit être un centre de traitement adapté aux nouvelles méthodes de cure, c'est à dire amenagé, équipé et dirigé suivant ses directives" (Léon Bernard 6).

This renaissance of the sanatorium principle necessarily leads to a reform of the sanatorium system. "One feels less and less that the sanatoria are monuments destined to endure . . . the economic crisis, the extension of collapse therapy, the grave question of post sanatorium assistance, these force us to revise our ideas and to look for new forms of institutions in order to solve the difficult problem of how to do more with less. There is an evolution, and sometimes a revolution in the dispensaries, hospitals, sanatoria (Burnet 7, 8)."

The reform of the sanatorium system must be accompanied by a new conception of the problem of after-care; treatment and after-care are but the two aspects of rehabilitation, "centres de traitement" should become at the same time "centres de réhabilitation."

"Dans l'état actuel de la lutte antituberculeuse, la cure sanatoriale reste donc à la base de la thérapeutique et de la prophylaxie. A la forme ancienne qui orientait la lutte contre la tuberculose dans la seule voie du sanatorium doit se substituer une formule nouvelle qui tout en laissant à la cure sanatoriale une place fondamentale doit donner une égale importance à l'aide du travail du tuberculeux . . . Pour tous ses demi-infirmes la cure sanatoriale ne trouve que rarement les indications formelles" (Bezancon 9).

It is generally believed that progressive treatment, especially the wide application of collapse-therapy will reduce the number of patients in need of after-care. But, on the other hand, treatment may increase the number of chronic cases and, therefore, that of patients in need of after-care.

It is generally agreed that as the sanatorium system changed in character the modern functions of after-care are not the same as they were a decade ago. In his report at The Hague, Vos put forward the hypothesis that the patients who to-day need after-care after their discharge from sanatoria are of quite a different type from those under discussion in 1922 when a similar theme was treated at Brussels.

"As regards the question of post sanatorium care it is not enough to devote one's attention to the social aspect of the problem alone, important though this side is. One must take into account the fact that many cases of tuberculosis run a course which is from the start, fixed and unchangeable, even though this course cannot always be foreseen. Through the application of modern methods, namely, collapse therapy, medicine has been successful in a greater measure than formerly in making the bacilli disappear from the sputum and the prognosis of the disease is thus considerably improved.

"Thus there is shown to be a prospect of raising considerably by means of long treatment, supplemented by after-care, the number of patients who can take their place in the open labour market." (Vos 10).

If this hypothesis can be proved, then with the change of outlook in prognosis, there will be also a corresponding change in the three groups into which Vos divides the after-care material, namely (a) those who after treatment of varying length are completely healed, and (b¹) those who regain their full earning capacity through *temporary* after-care or (b²) who retain it through *permanent* after-care and (c) those who cannot regain their earning capacity because their illness takes an inevitable and unstable course.

So far we know practically nothing about the proportions of these groups among the ex-patients of sanatoria and consequently we can say nothing as to how this proportion may change with the progress of therapy. There may be an increase in group a (completely healed) or b¹ (rehabilitated through temporary after-care) and a corresponding decrease in group b² and c, without any increase in the survival rate. There may be, on the other hand, a definite increase in the number of survivors and then it will have to be determined which of the above mentioned groups will gain by this increase.

These are the questions to be studied and if possible decided through medical statistics: whether in the course of a decade the after-histories of the tuberculous have changed—a decade in which tuberculosis therapy, diagnosis, and social medicine as a whole have made tremendous progress; and mortality has decreased in a measure surpassing all expectations. Whether the mortality from, as well as the fatality in tuberculosis has decreased and, whether the increase of survivors means an increase in the number of permanently disabled or of the permanently healed; and finally whether an improvement in the methods and the results of treatment leads to a reduction or an expansion of after-care activity.

CHAPTER 1.

Changes in Prognosis of Pulmonary Tuberculosis.

First we have to consider the results of investigations dealing with the statistical evidence of the influence of treatment, environment and other factors on case mortality.

Secondly, we have to establish the statistical evidence of the increase of the survival rate among tuberculous patients in consecutive year-groups since 1920, i.e., since the reform of the treatment was initiated.

There are various ways of approaching these problems by statistical methods. The classic method of deciding the merits of any method of treatment or care has been to compare the mortality of corresponding groups of patients subject to different conditions or different methods of treatment.

The statistical method employed consists firstly in establishing the fatality rate in certain groups of the tuberculosis population. (Jameson, Parkinson, Crowden). It was first applied to tuberculosis by William Farr in order to investigate the "law of mortality" i.e., the death rate in subsequent years among tuberculous patients supposedly taken ill on the same date.

While the material for the statistics of mortality is found in the great statistical documents, the material for the analysis of case mortality in chronic diseases must be obtained by means of a complicated statistical investigation. This material must include a sufficiently large number of people to be fairly representative of the different groups in which the tuberculous population may be divided. Each case must be followed up year by year and the full clinical and social status must be ascertained at regular intervals. There are but few follow-up statistics which meet these requirements. Therefore "the comparison of ultimate results of two institutions is even more hazardous than the comparison of the immediate results of sanatorium treatment." (MacNalty 11). The comparative method is always liable to errors, because to obtain satisfactory results, one should be able "to contrast as in an experiment two or more sets of figures which resemble each other in all or some of the essential points; and which only differ on that one point with which the formulation of the question has to deal." (Gottstein 12).

Statistical evidence of the influence of treatment, environment and other factors on case mortality.

Sanatorium treatment and survival.

These exact requirements for an investigation of the influence of mass-treatment upon case mortality are seldom fulfilled. It is not to be expected therefore that actual conclusions can be drawn. Nevertheless attempts have been made to do this. In the case of sanatorium treatment, the circumstances are particularly complicated because the patients in sanatoria are always a carefully selected group and it is practically impossible to make the same selection of patients for two comparative groups. Besides, the more widespread the treatment becomes, the more difficult it is to find for comparison subjects who have not undergone treatment (B. Hill).

As early as 1903, Stadler comparing the after histories of tuberculous patients treated by the out-patients' department of the Marburg Clinic with those of the patients discharged from Weickert's Sanatorium for working men came to the conclusion that the three-months' cure which was then customary for the working man in German sanatoria is able to lengthen life slightly, but does not affect the case mortality rate. A further attempt was made in 1910 when Elderton and Perry made an analysis of the statistical material compiled by Lawrason Brown and Bardswell. No statistical evidence could be produced to show that sanatorium treatment increased the expectation of life of the tuberculous patient compared with pre-sanatorium statistics. But even post-war statistics which are concerned with far longer periods of treatment did not yield a definite result. In 1922 Stocks and Karn analysed the after-histories of about three thousand cases, one-third of whom had been treated in sanatoria. "After allowing for difference in age, sex, stage, severity of symptoms, home conditions, and social grading, they were unable to find any advantage of the sanatorium treated group as regards survival or progress, except the far advanced, nor could any significant correlation be discovered between progress and length of stay in sanatoria." (cf. Stocks 13).

Whitney and Myers recently studied the effect of the length of stay in a sanatorium upon the expectation of life. They reached a paradoxical conclusion: the length of treatment has no appreciable influence upon the expectation of life, and it is a striking fact that even less influence is evident in minimal cases than in moderately advanced cases.

Münchbach on the other hand, is able to give a definite advantage to prolonged treatment. Similar results have been obtained by Brauening and Guinard; and the explanation of these paradoxical facts may again lie in the fact that the groups compared are not comparable. This is especially true of the investigation into the importance of the length of treatment. The incurable case too often remains for a long time under treatment. The more hopeful cases leave often at an early date. Economic and social reasons are usually responsible.

Expert opinion has come to the conclusion: "It has to be admitted by a dispassionate critic that up to the present time no satisfactory statistical proof of the curative advantage of sanatorium treatment has been produced. The other advantages, in the majority of cases may be taken for granted." (Stocks 13).

The explanation may be the same as it was in 1910: when Pearson (14) commented upon the results of Elderton and Perry "In this as in many other problems of medico-statistical nature we lack the comparative data on which alone sound judgment can be based and are liable to replace scientific certitude by impressions and opinions . . . Sanatorium treatment is of the nature of a reconnaissance, it is not a demonstrable victory."

Pneumothorax treatment and survival.

Passing over the statistics on the effect of tuberculin treatment, we find the same questions and the same problem again, when calculating the value of pneumothorax treatment. Although we have at our disposal statistics which definitely prove that pneumothorax treatment is one of the most effective known methods of treating tuberculosis, especially when one considers at the same time the additional or supplementary operations including thoracoplasty, the results obtained by the comparative method remain still unsatisfactory.

In the collective statistics compiled by the Joint Tuberculosis Council the difference in the survival rate in corresponding groups of pneumothorax and non-pneumothorax cases is quite insignificant. 200 institutions were asked to collaborate and 3,021 pneumothorax cases were followed up until the end of 1931. After the statistics of this extensive material had been worked out by an expert in vital statistics, it was shown that "the results are inconclusive." (15)

But a considerable improvement in life-expectancy was recorded in cases where the collapse can be made complete and in cases where the other side is clear—conditions which are only fulfilled among a small number of tuberculous patients, whereas according to the same statistics when the artificial pneumothorax is incomplete or when the other side is affected, the results are not much more favourable than under conservative treatment (Fig. 1 & 2.) (Wingfield).

The statistics compiled by Bentley show a definite increase of the survival rate of pneumothorax cases. Bentley compares the after-history of 677 pneumothorax cases with that of 3,329 conservatively treated cases over a period of 3-5 years. Out of 155 "complete collapse cases" (T.B. +) 65% had negative sputum records on discharge, and 90% were still alive after 3 years; whereas only 60% of those discharged with positive sputum survived at the end of 3 years. Out of 140 cases where collapse was not complete, less than half were negative on being discharged and hardly more than three-quarters were alive after 3 years. "The survivals in all the cases investigated were approximately 20% higher in the pneumothorax group than the expected number amongst those conservatively treated." But in 1934, only 10% of the tuberculous patients in the care of the L.C.C. were treated in this way. "20% improvement in 10% of patients would heighten the general level of results in all cases undergoing residential treatment by only 2%. . . . The application of artificial pneumothorax therapy cannot be expected therefore to alter materially the gross statistics of the results of anti-tuberculosis schemes, but will continue to be of vital importance to selective individual sufferers." (Bentley 16).

The same question has been studied by Münchbach. He found that in the pneumothorax group there were 10% more survivors than in the corresponding non-pneumothorax group. During the years 1920 to 1927, 11% of the open cases admitted to the sanatorium underwent pneumothorax treatment.

Immediate results of combined intensive treatment.

But this type of statistical analysis does not do justice to the progress of modern therapy.

To obtain a true conception of the influence of modern treatment, one must take into account the effects not only of pneumothorax therapy, but of the whole gamut of modern tuberculosis therapy. Pneumothorax treatment is only *one* of many factors in a scheme for the varied and intensified treatment of tuberculosis, which includes early detection, radiological control, a practically unlimited stay and surgical treatment as well as clinical treatment, e.g., gold-therapy.

This is demonstrated by the statistics of Christensen, for under routine sanatorium treatment 30% of tubercle positive cases on admission became tubercle negative cases, while when this treatment was combined with pneumothorax treatment 50%, and with the triple combination of sanatorium treatment, pneumothorax treatment and gold therapy the figure reached 65%. Turning to the *immediate* results the effect of modern treatment becomes evident in the steadily increasing proportion of the +— cases at discharge. This improvement of the

Graph showing the effect of Artificial Pneumothorax Treatment on the probability of survival (reproduced by the courtesy of the Brompton Hospital).

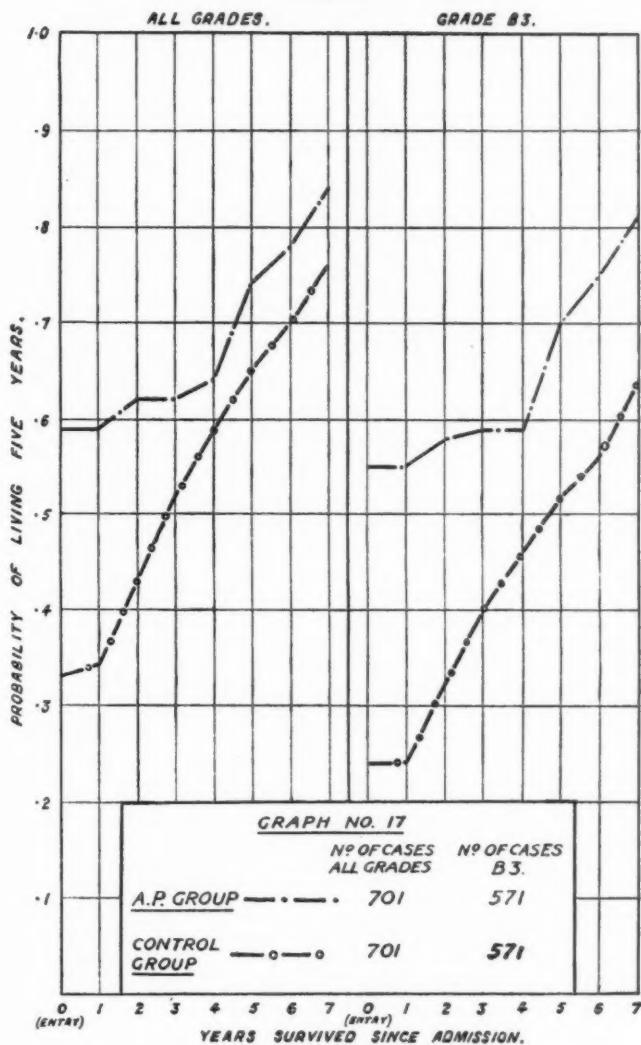


Fig. 1

ARTIFICIAL PNEUMOTHORAX TREATMENT.

GRAPH SHEWING THE EFFECT OF THE CONDITION OF THE CONTRALATERAL LUNG ON THE PROBABILITY OF SURVIVAL IN THE CASE OF PATIENTS WHO RECEIVED ARTIFICIAL PNEUMOTHORAX TREATMENT.

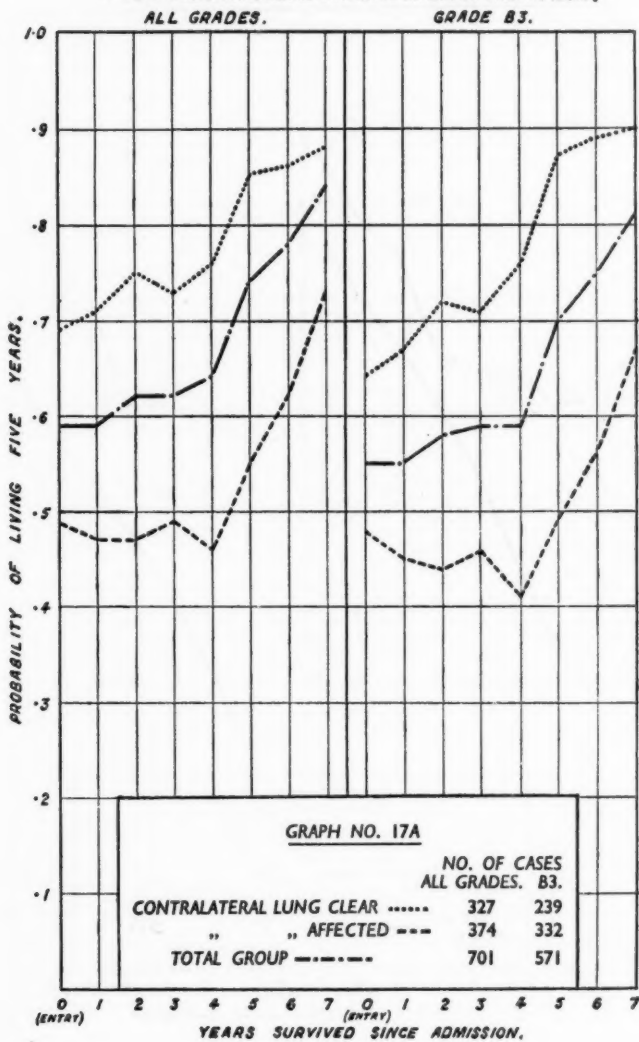


Fig. 2

immediate results is due mainly to an extension of collapse-therapy and is shown in the table, demonstrating the steady increase of immediate results in the material of the Bilthoven Sanatorium from 1921-1936 (Fig. 3). How such an increase necessarily improves the level of ultimate results, will be shown later.

Table showing the increasing proportion of $++$ cases on discharge from Sanatorium Berg en Bosch Bilthoven (Holland) from 1921-1936.

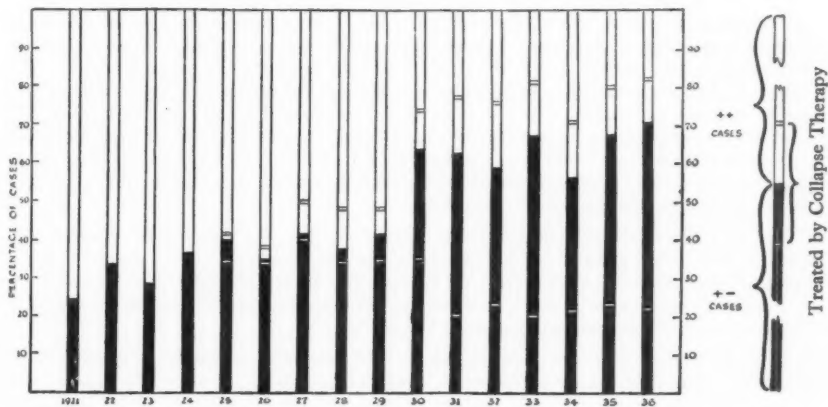


Fig. 3

Environment and life expectancy.

It is generally assumed that private sanatoria or sanatoria for the better class patients have on the average more favourable results than those obtained by the sanatoria for the working man. "The patient in a good economic position can, upon his discharge from a sanatorium, live the carefully regulated life prescribed under satisfactory conditions with a good prospect of the benefit he has received from sanatorium treatment being consolidated. The patient less favourably circumstanced on the other hand returns only too frequently to the full stress of life, to unsatisfactory conditions of living and finds it impossible unaided to carry out the directions he has received. It is the common experience that patients so situated not infrequently relapse." (MacNalty 17).

In other words, experience as well as a general impression testifies that in good social circumstances and in good living conditions (Braeuning), tuberculosis takes a more favourable course than in a socially inferior environment; and that in particular the success of treatment shows itself to be largely dependent upon environment and *after-care*. This experience has become a conviction; and it is possible to prove it by statistical methods.

The problem becomes even more complicated if one tries more fully to analyse the factors of environment; and to consider the question whether it is unsuitable work or premature resumption or inadequate standard of living which is to be held responsible for relapses.

In the Annual Reports of the Midhurst Sanatorium the large number of re-admissions is attributed directly to a breakdown due to unsuitable work. On the other hand a regular wage—even if it is a minimum—is considered to be more

important than the nature of the work. The economic risks of a change of profession have been studied by Stadler as long ago as 1903. In his follow-up statistics, he considered the expectation of life of the tuberculous in relation to work and profession, and was unable to establish that the kind of occupation or labour had any effect upon the expectation of life. Indeed he uttered a warning against any experiments in changing a profession. The importance of a regular wage was insisted upon by Varrier-Jones.

Ascher believes that he has proved that unemployment in Germany lengthens the life of the young tuberculous worker who is sufficiently provided for. He attributes this to the release from work and the proper utilisation of leisure. His figures are too few and thus his conclusions are not always well founded, though it is perfectly comprehensible that a rest of this kind would have good as well as bad results. In any case it is certain that as a result of part-time work and increased leisure the fatality rate in the last few years shows a favourable tendency in spite of the depression and the economic crisis. The total mortality from tuberculosis has not been affected by the depression and the crisis.

On comparing the statistics of the results among private or middle-class patients and the patients of the sanatoria for the working class, there exist unquestionable differences in favour of the socially better placed classes. But there is hardly enough material for a comparison between the statistics of ultimate results of private sanatoria and working-class sanatoria.

Zinn found that the expectation of life and the prospects of healing from artificial pneumothorax are considerably greater (about 50%) in a socially independent group than among the working classes, whereas Bentley found only a 10% improvement.

Spiro established, from observing the small group of patients in an institution belonging to the Employee Insurance Company (Angestelltenversicherung) of Berlin, that the expectation of life in the case of the middle class tuberculous employee is on an average greater than in that of the tuberculous working man.

The ultimate results obtained by the Midhurst Sanatorium, where the greater part of the inmates are middle-class patients, are better than the results obtained by the Cheshire Joint Sanatorium whose patients are mainly working men.

As early as 1919 Bardswell pointed out that the figures of the Adirondack Sanatorium (Trudeau, America) are more favourable than the Midhurst figures—"but not more so than was to be expected having regard to the slightly better social class from which the patients for that institution were drawn."

H. L. Barnes took as the subject of his investigations a privileged group. In the State Sanatorium of Rhode Island an increasing number of ex-patients were employed on the staff of the sanatorium in the years 1906-1916, so that in 1916 80 of the employees were ex-patients. Altogether 286 ex-patients were employed during this time. Of these, 66% were still sputum positive cases. Almost all the cases belonged to the groups of those discharged "apparently cured, arrested, apparently arrested, quiescent, improved." After two years to twelve years from discharge there were:

Sputum record	Total No. of cases		Living.	Dead.	Unknown.
+tb	190=66%	..	120=63%	65=34%	5=2%
-tb	96=33%	..	81=84%	7=7%	8=8%
Combined	286	..	201=70%	72=25%	13=4%

Barnes then attempted to compare the after-history of the ex-patients employed in the sanatorium with that of similar cases discharged from the sanatorium, who shared the lot of most ex-patients of sanatoria. It was shown that, leaving out of consideration those from both groups who were discharged unimproved, 69% of the sanatorium employees and 55% of the others were still alive on January 1st, 1918.

Details from the chart, including those discharged unimproved, shows the position to be as follows :

Ex-patients	Number Living.	Number Dead.	Number Unknown.	Living %
Sanatorium employed	123	53	5	67
Otherwise employed	955	1754	197	51

Thus of the ex-patients employed in the sanatorium 25% more survived than of the other, far larger group. In consideration of the fact that two-thirds of the patients concerned were open cases, this result is remarkable and Barnes' recommendation that ex-patients should be employed on a large scale on the staff of the sanatoria, has from the stand-point of the management only this against it : that, after all, 21% suffered relapses almost immediately.

Some recent statistics which concern a favoured group of patients have been published by Knight and Dublin.

These patients, about 1,448 in all, are employees of the Metropolitan Life Insurance Company, who were treated in this Company's sanatorium during the years 1914-27.

They had various advantages, firstly the early detection which seems to be very efficient in this instance when compared with Drolet's drawn up on a study of patients received in various sanatoria in the U.S.A. :

	Incipient.	Moderately Advanced.	Far Advanced.
Knight and Dublin	38.5%	34%	19%
Drolet	16%	34%	50%

Secondly the length of treatment was greater than the average length of treatment in corresponding classes of institutions for the working man. Incipient cases remained on an average six months in the sanatorium; moderately advanced cases ten months; and far advanced twenty-three months.

The final result is shown in the following table. The relation of actual to expected deaths was :

	Incipient.	Moderate.	Far Advanced.
Knight and Dublin	1.29	5.5	16.9
*MacSweeney	6.0	16.0	38.0
Midhurst (1907-1914 incl.) ..	5.8	16.6	38.5
Frimley (1905-1914) ...	3.9	16.1	40.1
Trudeau (1885-1909) ...	3.1	10.8	41.4

* MacSweeney's figures are comparative ones and are taken from the averages of discharges from sanatoria in the U.S.A.

Early detection, sufficiently long sanatorium treatment, the guarantee of adequate economic conditions, and regular hours of work have a definite influence upon the prognosis of tuberculosis.

In the years 1916-1931 the Trudeau Sanatorium treated 238 doctors and medical students (7.1% of the total number of their patients). It is interesting that only 25% were received as incipient cases, while it was reckoned that 21% of the total sanatorium admissions were so received; that is to say that the standard of early diagnosis in the group of medical students and practising doctors was not so very much higher than in the other groups. Among this group of doctor patients the mortality was still lower (10%) than the average among Trudeau patients. Robert R. Bates (18) attributes this favourable result to the fact that "the doctor patients are more careful about what they do than the average ex-patient." Nevertheless a thorough analysis of the activities of these doctors shows that the majority took up work of which part was very arduous immediately on their discharge from the sanatorium.

These statistics have the inevitable disadvantage that the figures are comparatively small, because the experiments themselves, as far as they are carried out at all, are carried out on a very small scale.

Most of these statistics have therefore only an historical interest. They do however, illustrate that the social standard of the tuberculous patient, the conditions of his life, earnings and work after his discharge, influence the expectation of life in a noticeable degree.

Change in the epidemiological type.

The question as to how far there has been, in the course of time a spontaneous change in prognosis of pulmonary tuberculosis has been repeatedly discussed by many authorities. The statistical material so far produced has appeared to be totally insufficient to decide the question. This partially results from the fact that in the pre-Koch period the diagnosis of pulmonary tuberculosis was made clinically; and in the post-Koch period it was made by bacteriological methods while to-day it is proved by X-Ray pictures.

Descriptive epidemiology leaves no room for doubt that the general epidemiological aspect of tuberculosis has changed considerably in the last one hundred years. It would be contrary to all epidemiological experience if, when mortality has decreased by 50-70% (which means that there has been a tremendous decrease in general infection) some change had not taken place in the type of disease.

Variations of this sort in epidemic diseases are well known, for example in syphilis and leprosy. Similarly a history of the epidemiological variations in tuberculosis would show the changes in the types of tubercular disease.

"In Paris, just after the time of Napoleon, Laennec tells us that about one-third of the patients attending the hospitals suffered from phthisis and the death rate must have been appalling. Now the mortality is steadily falling and what is perhaps more significant, certain forms of the disease are disappearing. Twenty years ago Cobbett commented on the decline of *tabes mesenterica*, out of all proportion to the fall of tuberculosis mortality of other forms of the disease. An older generation described a condition known as tuberculosis of the sole of the foot in young children. It is said to have disappeared with the improvement in social conditions and the disappearance of the barefoot urchin of the slums. Certain forms of bone

and joint tuberculosis also seem to be less prevalent, notably tuberculous dactylitis . . . bronchopneumonia of childhood seems to be a less prevalent disease than it was." (Gloyne 19)

The decrease of malignant haematogenous forms among children and young adults has been definitely proved. The statistics of mortality agree in showing a general decrease of tubercular meningitis and of miliary tuberculosis in the first years of life. In connection with this the influence of prophylaxis on contacts can certainly be proved. The preponderance of malignant forms in the case of massive infection or of spreading disease, and the much milder epidemiological aspect in cases of creeping infection are generally admitted.

One can bring about a change in the epidemiological forms with experimental confirmation by altering the conditions of contact in the radius affected by the spreading focus. That ideal conditions have been able to play an important part in preventing any clinical manifestation during infancy and childhood has been shown also by Bardswell. If the infection takes a mild course during childhood as a result of prophylactic measures respecting contact infection, it is very probable—according to the theory of Andvord, that the period of exacerbation—that is the adult phase—of that generation, will take a correspondingly mild course and claim fewer victims.

One of the most interesting facts shown by statistics relating to the decrease of mortality from tuberculosis is the recent levelling down of the maximum of mortality reached during the adolescent period. (Dublin). Hence it is possible that pre-phthisical types of tuberculosis are becoming more and more frequent.

If this epidemiological change be accepted then the prospects of therapy will be widened probably because it is generally believed that a slow development of the disease will improve the chances of success of therapeutic measures.

Summary.

From the foregoing discussion of the series of factors definitely influencing the course of the disease it appears that modern treatment is the most important, so far as immediate results are concerned. If this modern treatment can be applied more widely, its effect being measured by the proportion of tubercle-positive cases becoming negative, and if after-care can retain this result, a still greater rise in the survival-rate will follow.

Statistical evidence of the increase of survival-rate in consecutive year-groups.

From the practical standpoint of social medicine the most important question to be asked of statistics is this: how far can the effect of the revolution and re-organisation in the general methods of clinical diagnosis, surgery, therapy, early detection and treatment, be seen already in the general prognostic outlook? Does the graph which represents the law of mortality for tuberculosis show an increasing tendency to descent since this treatment has been more generally applied? This will be demonstrated by establishing the fatality-rate in the pre-sanatorium-period, in sanatorium, but pre-collapse-therapy-period and since 1920 when modern treatment may be said to have begun.

Survival-rate in pre-sanatorium period and down to 1920.

It is difficult to provide statistical evidence to show a change in the prognosis of pulmonary tuberculosis, in the period from Laennec's time until 1920. Elderton and Perry came to the conclusion that up to 1910 no statistical evidence could be obtained that prognosis has changed.

William Farr worked out on the basis of Louis and Bayle's records, the law of mortality for phthisis (calculated for hospital cases.) The numbers of the dead were :

62%	in the first year after the manifestation of symptoms.				
85%	"	second	"	"	"
95%	"	fifth	"	"	"
97%	"	tenth	"	"	"
100%	"	fortieth	"	"	"

In 1852 we learn from Leudet that of 409 patients under institutional treatment, 70% died after five years; and of the patients under private treatment 77.2% was the corresponding figure. Within 20 years 100% of both groups had died. Statistics by Croner, taken from the post-Koch period, tell of 456 working men suffering from active tuberculosis and insured by a life insurance company. The number that died may be set out as follows :

53.2%	in the first year after the manifestation of symptoms.				
74.6%	"	second	"	"	"
87.2%	"	third	"	"	"

In 1909 Pringle followed up 108 cases of "pulmonary tuberculosis which were known in Ipswich, a medium-sized English town, and who were treated under the Poor Law. The figures are as follows :

50% died in the first year; 80% died within the first three years; and after ten years only five remained alive. The high fatality rate among open cases of pulmonary tuberculosis is still very little diminished as is shown by the carefully compiled statistics of Braeuning and Kayser-Petersen and Lissant Cox.

Five years after diagnosis 79% of those on the register had died (Braeuning) and in Kayser-Petersen's case 68.2%. The collective statistics for Switzerland show a mortality of 80% 15 years after discharge from sanatoria. These high figures must be contrasted with those established cases of bacillary pulmonary tuberculosis which have been described as completely cured. In Hamel's extensive general statistics for the pre-war period, the number of healed from a group of originally sputum positive cases were given as follows :

TABLE COMPILED FROM HAMEL'S FIGURES.

Years. (after)	Stage One. %	Stage Two. %	Stage Three. %
3	7.3	2.1	1.8
5	12.0	5.2	2.4
7	15.3	7.7	6.7

It is unfortunate that Hamel's figures are not complete on account of the number of cases who remained untraced.

There are, in the reports of a number of English County Councils, carefully analysed statistics of notified cases of tuberculosis removed from the dispensary register owing to recovery or death. For the sputum positive cases of tuberculosis notified in the years 1927, 1928, 1929, 1930 the following table has been compiled; the position in 1934 was as follows :

COMPARATIVE STATISTICS OF THREE ENGLISH COUNTIES.

Year Group.	Norfolk.		Kent.		Durham.	
	% dead.	% recov.	% dead.	% recov.	% dead.	% recov.
1927	72	2.1	70	2.9	66	2.8
1928	69	4.0	68	3.3	72	.9
1929	68	1.3	66	2.0	79	.8
1930	64	—	60	.8	75	.4

The value of these statistics is much diminished by the fact that 15% of the cases were "unknown" i.e. untraceable. Nevertheless it is possible to obtain a fairly accurate picture of the standard of fatality from 1920-5 as far as open cases of pulmonary tuberculosis are concerned. The following table is drawn from the statistics published by Lissant Cox.

Year-Group.		Recovered*.	Dead*.
1920 (736 Tubercle + cases)	after 13½ years ...	6.3%	90.2%
1925 (802 " + ")	" 8½ " ...	2.5%	88.5%

(After deducting patients left county, untraced, ceased treatment for other than medical reasons and deaths from other than Tb).

"Pulmonary tuberculosis has a fatality similar to Cholera or Meningitis cerebrospinalis" (Gottstein 20).

3. *Survival rate since 1920 in consecutive year-groups.*

It is now necessary to consider whether the prognostic aspect of pulmonary tuberculosis has been changed since 1920. A comparison of the statistics of mortality in consecutive years is indeed still impossible in any exact form. The material is not similar, or rather, the difference in the material is impossible to express in figures. But if one confines oneself, in the interests of accuracy to sputum positive cases of pulmonary tuberculosis, it is none the less possible to restrict to a large extent the sources of error.

One must ensure if possible that the material from consecutive years is approximately comparable. For instance, when comparing the different year-groups of sanatorium patients one must check the composition of the material by keeping a record of the proportion of the different stages. The primary difficulty is to fix the date when the illness began. As Farr has remarked in his classic treatise, one needs to know the moment when the illness first manifested itself in order to determine the law of mortality.

If one could establish the date on which the infection took place, it would be easy to prove tuberculosis to be one of the most benign of diseases. Statistical calculations of this nature have been made in the case of contact infection in children, and the groups arranged according to the age at which infection took place. It has been shown that the disease takes a more serious turn and more fatal course in contacts who are older children or adolescents than amongst younger children. If one takes as the first symptoms the initial manifestations of the adult type of phthisis—hæmoptysis, pleurisy, initial infiltrations, etc., difficulties arise when one attempts to fix a date for the beginning of the disease process. The start of the disease is often so insidious with no tangible and evident manifestations that the patient's first illness never comes to the notice of the physician. Thus an exact calculation of the fatality of tuberculosis must remain a matter of considerable difficulty. In confining oneself to cases of open pulmonary tuberculosis, one is abandoning completeness in the interests of approximate accuracy.

Where the dispensary service is well organised, a case of tubercle-positive pulmonary tuberculosis is certain to come under the observation of the dispensary physician in the same year in which activity has appeared. It is possible to date the beginnings of active pulmonary tuberculosis from the date of the first records of bacilli without committing too great an error.

In these statistical comparisons a distinction must be made between the statistics which reckon the fatality rate among the tuberculous population in one or several dispensary areas, or in a whole country, and sanatorium statistics which deal with a selected group of patients. No acute cases or cases which are hopeless

* "Dead" and "Recovered," these definitions are taken from the designations entered in the register when the name of the case is removed; and are stated as the cause of removal.

from the onset are included in the sanatorium statistics; and the effect of these two factors, therapy and after-care is necessarily more evident among the sanatorium patients than among the total tuberculous population. In the statistics of sanatoria it is not the beginning of the disease which is taken as the starting point, but the date of discharge from the institution. Then too the kind of patients in institutions alters in the course of years; the advanced cases tending to preponderate more and more with the continual progress of therapeutic treatment. The number of re-admissions too is increasing; all these are sources of error which increase the difficulty for the statistician in comparing consecutive year-groups. As the number of advanced cases in sanatorium patients increases year by year and the number of cases in which the illness is of long standing rises in subsequent year-groups, the possible errors do not affect the results in an unfavourable way. Indeed the correction of the errors would even increase the difference between the fatality rate of two consecutive year-groups.

Follow-up statistics of County-Councils and Municipalities.

In the follow-up statistics of the London County Council which have been kept ever since 1921, a statistical record of those discharged year by year from its institutions has been included; and in these no improvement of the ultimate results is noticeable. The patients in question—about 4,000 cases each year, come from the most varying conditions; and they are discharged from institutions which themselves vary in character.

It is possible to establish that in 1929 there was a slight improvement in the expectation of life in the group of B₁ cases, though this is not evident in the total results. The group of patients has similar composition in 1926, 1927, 1928, as the following table shows:

Stages.		1926	1927	1928
A=Sputum Negative	.. .. .	20.5	19.8	19.9
B ₁ =Minimal	.. .. .	55.3	54.8	55.0
B ₂ =Moderately Advanced	.. .. .	24.2	25.4	24.8
B ₃ =Far Advanced	.. .. .		

Percentage of patients known to be alive 5 years after completion of treatment during 1921-1929.

Year of discharge	1921	1922	1923	1924	1925	1926	1927	1928	1929
Total									
number discharged	3,479	3,401	3,565	3,767	3,969	4,115	4,023	4,255	3,940
Percentage surviving	%	%	%	%	%	%	%	%	%
A	83.5	80.6	78.9	75.9	75.2	76.2	73.5	75.1	76.6
B ₁	61.5	60.1	63.0	65.5	61.6	62.5	67.9	65.7	72.1
B ₂	34.0	33.9	32.5	32.3	30.9	28.4	33.8	34.6	35.2
B ₃	3.7	5.6	6.9	4.4	4.0	4.0	6.1	4.7	4.4
Percentage of all patients surviving	.. 36.1	34.2	35.1	33.7	33.7	31.9	33.9	34.7	35.2

Thus in group B₁ only, the number of survivors is shown to have increased by about 7% in 1929.

Lissant Cox in his annual Reports (Lancashire C.C.) regularly gives information about the statistical composition of the tuberculosis population in his district. In the Annual Report for 1933 the year-groups 1920, 1925 and 1930 are analysed and the charts of case mortality made out and compared.

"It is possible in the foregoing table to compare results of treatment after 8½ years of supervision by the dispensary staff, of the 1920 and 1925 patients.

The percentages of survivors do not disclose any improvement in 1925 (20.8% alive) over 1920. (25.1% alive). It is true that during this period few patients received collapse therapy.

"Another comparison can be made of patients who had been on the dispensary register for an average period of three years and a half. Here, 1930, shows a small but definite improvement over corresponding figures from 1920 and 1925" (Lissant Cox 21).

Out of the patients who came on the dispensary registers (only tubercle-positive cases) were alive:

Year-Group.			after 3½ years.	after 8½ years.
1920	...	...	21 %	11.7%
1925	...	...	24.5 %	11.6%
1930	...	...	30.4 %	—

Braeuning published a complete chart of mortality for the year-groups 1920, 1927, 1930 and 1933 (Stettin industrial town with 260,000 inhabitants) and used it for similar comparisons. The fatality rate of the year group 1920 is shown to be very high, about 40% of the deaths occurred in the first year and 85% in the second year. The next-year groups, however, show a definite and increasing improvement. (Fig. 4.) He draws from these facts the conclusion that in spite of the grave prognosis of active pulmonary tuberculosis, the case fatality rate shows a definite tendency to improve considerably in the last decade.

Graph comparing the mortality of tubercle-positive cases who came on the dispensary register in 1920, 1927, 1930, 1933 (Braeuning Stettin.)

(Reproduced from *Zeitschrift f. Tbc.* 1936, Vol. 15).

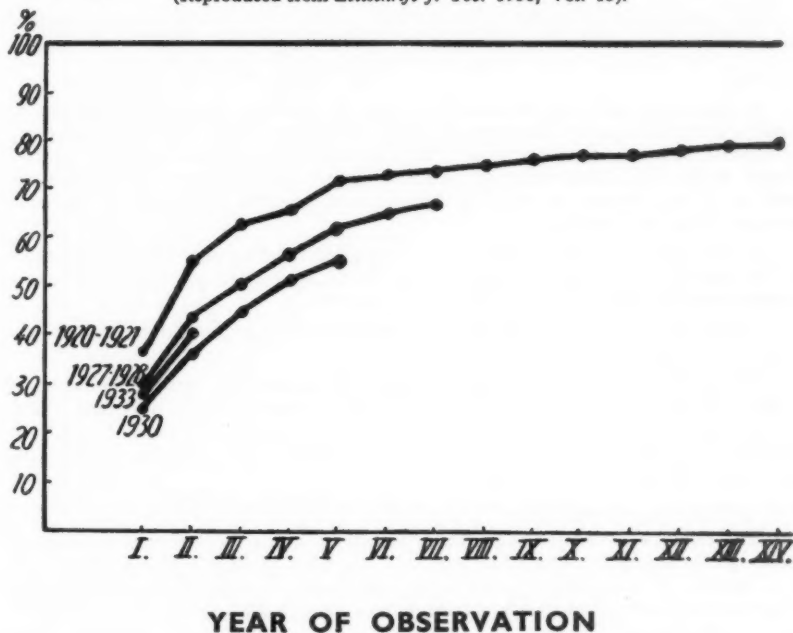


Fig. 4

Kayser-Petersen carried out similar investigations in Jena (a University town in central Germany with a higher social standard-Zeiss factory), and followed up the progress of the active cases of tuberculosis which came for the first time under the observation of the central dispensary. (Fig. 5.) If one compares the figures obtained by Kayser-Petersen with those of Braeuning, Kayser-Petersen is seen to have more favourable figures of early mortality for the first five years in Jena than Braeuning in Stettin.

The following table shows this clearly :

Years.	Year group	1920-21		1927-28		1930-31	
		Jena.	Stettin.	Jena.	Stettin.	Jena.	Stettin.
		%	%	%	%	%	%
1		14.9	39.2	12.9	30.0	5.7	27
2		48.9	67.0	45.5	52.0	25.2	47
5		68.2	79.0	61.2	65.0	—	—
10		80.1	85.0	—	—	—	—

For the years 1920-21 the final results recorded by both observers show the percentage of deaths after ten years to be about 80% or 85%. Now this year-group particularly is severely affected by the troubles of the post-war period. It was in this year that especially acute and malignant forms of tuberculosis were observed in Germany; presumably there is a connection between this and the influenza epidemic. The early mortality is far higher in Stettin than in Jena. This difference is probably to be explained by the very different economic character of the two towns and the differing natures of their industries. The circumstances in the year 1927 are very similar.

The periods of observation for the year 1930 are as yet too short and the figures too small, for any definite conclusions to be drawn.

Summary.

In four large districts in different countries (London, Lancashire, Stettin and Jena) charts of mortality amongst tuberculous patients from different year-groups have been made out according to an extremely consistent statistical method, and the results compared. The quota of deaths for the year 1920 is at about the same level in all the districts in spite of the very considerable differences in the composition of the population.

In the following decade there is a noticeable improvement in the expectation of life of the B¹ group in London: in Lancashire it is not until 1930 that a decided improvement in case-mortality appears.

Stettin shows a clear, steady and considerable decrease and Jena shows the greatest decrease of all.

Throughout this period, collapse therapy developed to a very different extent in different places; and the number of tuberculous patients who underwent sanatorium treatment has steadily increased. (In 1934: 90% in Jena and 69.5% in Lancashire). The statistics for London deal exclusively with cases that had received some form of residential treatment.

Follow-up statistics of sanatoria.

The question as to whether the expectation of life for tuberculous patients shows an increasingly favourable tendency has been studied with particular care by a number of sanatoria. Some of the well-known and leading sanatoria have a statistical department in which, according to custom, each year-group is recorded, and its afterhistory followed up regularly (Frimley, Midhurst, Cheshire Joint

Graph demonstrating the mortality of tubercle-positive cases who came on the dispensary register in consecutive years 1918-1930, followed up after 3 and 6 years respectively (according to Kayser-Petersen and Raeder).

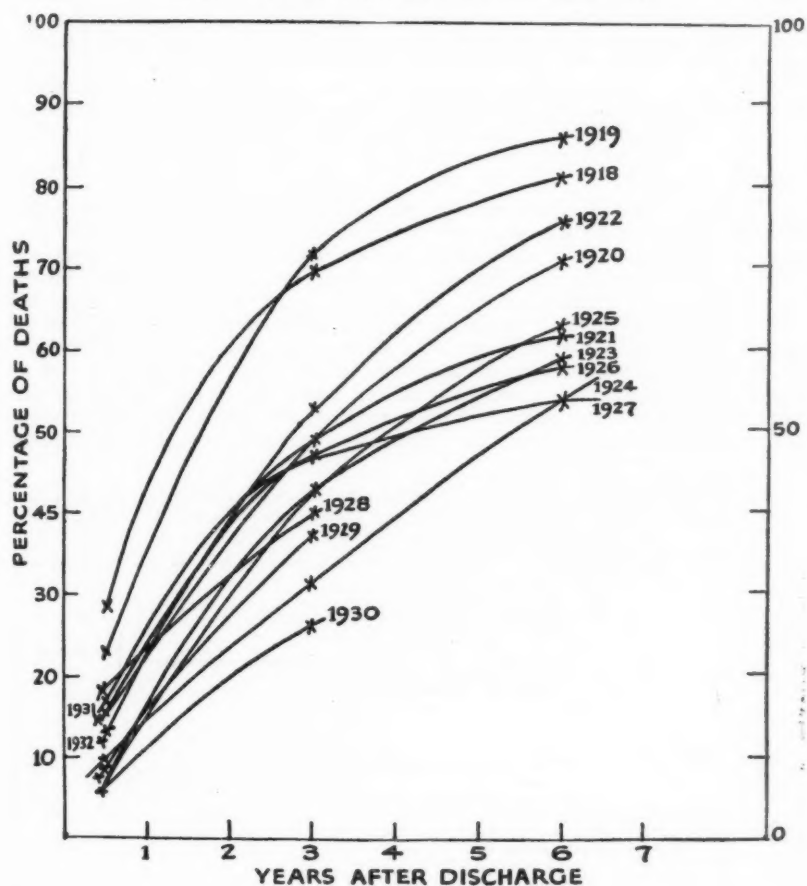


Fig. 5

Trudeau, Bilthoven, etc.). In certain institutions the improvement in prognosis in the course of years has been made the subject of a special investigation (Frimley, Friedrichsheim, Luisenheim, Barmelweid).

In order that the material used might be as similar as possible, 'only figures of tubercle positive cases are considered here'. Further, we have, when possible indicated the individual years separately.

In his follow-up statistics, Krebs compares the ultimate results of patients discharged from the Sanatorium Barmelweid in the period 1912-1928, thus the war period is included. He finds an average improvement of 3% in the first stage, 6.9% in the second and 5% in the third stage (cf. Fig. 6); and he concludes from this that the prognosis of tuberculosis has improved in the course of the years. All the means afforded by modern statistics were used by Wingfield in examining his material, and the expectation of life for patients discharged from the institution was calculated, taking into account its dependence on age, sex, stage and extent of the disease. The progress of patients treated by artificial pneumothorax is discussed in special statistics.

Wingfield compares the average expectation of life of patients treated during the years 1915-31 with the results shown by his own pre-war statistics, which cover the period 1905-14. (Fig. 7). Although there were more advanced cases and selection was less careful in the war and post-war period the expectation of life for men has become somewhat greater. In the case of women no improvement has been observed. Wingfield is probably right in attributing this to a change in the type of patient and to the growing quota of working women among his patients. He draws from his figures the pessimistic conclusion that "the prognosis of an average case of pulmonary tuberculosis has not materially changed during the past thirty years and that our patients of more recent years show an after-history very similar to those of cases treated in the earlier period." (22). Only a selected group, the

Graph comparing the mortality of cases (tubercle-positive on admission) discharged in the year periods 1912-1920 and 1920-1928 from the Sanatorium Barmelweid (Switzerland). (Reproduced from Brauers Beitrage, Vol. 64, 3).

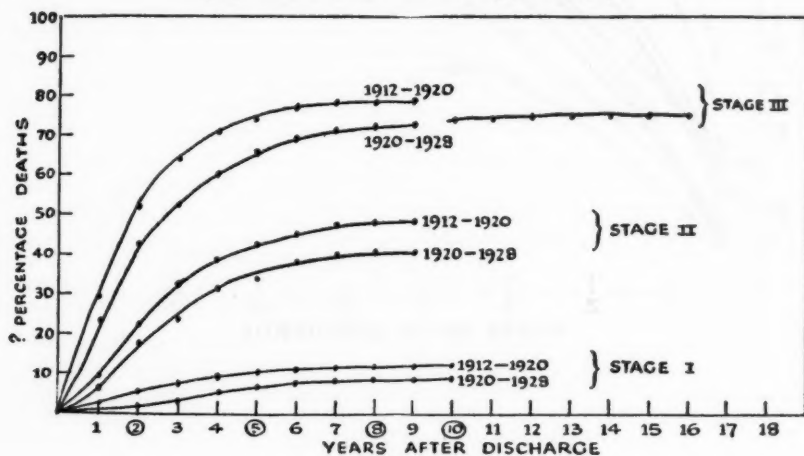


Fig. 6

GRAPH COMPARING THE PROBABILITIES OF SURVIVAL IN RESPECT OF PATIENTS ADMITTED TO THE SANATORIUM DURING THE PERIODS: (1) 1905-1914; (2) 1915-1931; AND (3) 1905-1931.

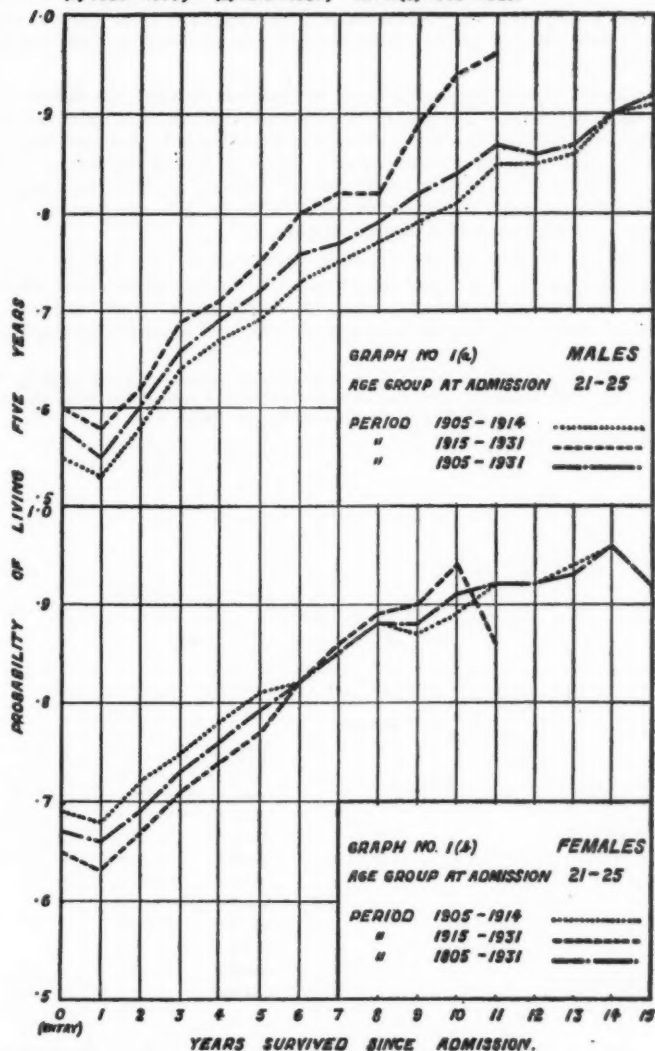


Fig. 7

(Reproduced from Brompton Hospital Report)

group of pneumothorax patients, shows a definite improvement in the expectation of life: the more complete the collapse, the more favourable the results, provided the other side is not affected.

This may be rather a pessimistic view and the sum total of the results is perhaps not so unsatisfactory after all. When the periods 1905-14 and 1915-30 are compared, the unfavourably situated patients from the war and post-war periods are included in the second period.

If one were to group the figures into three periods or more, the difference might become more apparent. Wingfield himself says that the "standard of selection of cases admitted to Frimley during the earlier period was higher than was the case in the later years of the investigation." Thus a set of patients in which the standard of selection was lower, had, on an average, in the years 1915-31, the same expectation of life, as the set of patients of the pre-war period. For men the expectation of life indeed is slightly improved.

The Annual Reports of the Cheshire Joint Sanatorium contain continuous follow-up statistics for the years since 1924. The sanatorium caters chiefly for industrial workers and the average mortality has been relatively high. If we plot from the chart published in the report for 1936 the graph of mortality for each separate

Graph comparing the mortality of cases (tubercle-positive on admission) from the Cheshire Joint Sanatorium in consecutive years 1924-1934 (calculated from the data published in the Annual Report 1936).

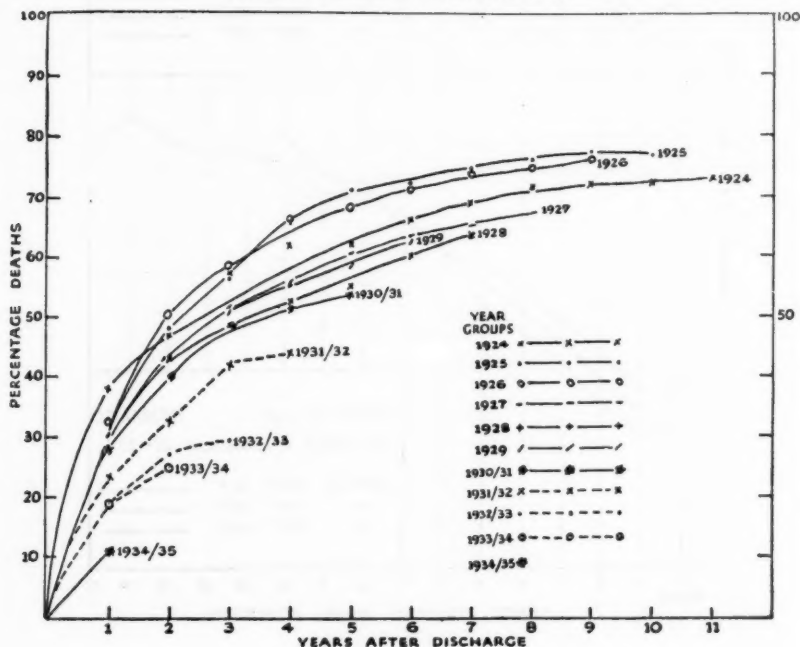


Fig. 8

year-group (tubercle positive cases) we see that the mortality has decreased three years after discharge by 30% (cf. Fig. 8). The Annual Reports state that collapse therapy in all its forms made progress during this period, and produced very satisfactory ultimate results. There is a probable connection between this and the fact that the number of tuberculous (sputum positive) patients discharged as sputum negative cases rose during these years to 56% of the positive cases admitted.

The Midhurst Sanatorium also gives in its Annual Report an uninterrupted and complete series of follow-up statistics covering the years of 1906 to 1935, in which more than 90% of the cases were traced.

This Midhurst statistical scheme continues the work organised and inaugurated by Bardswell.

We have plotted the graph of mortality in sputum positive cases of tuberculosis for the years 1910, 1920, 1925 and 1930-4 on the basis of the data presented in these Midhurst charts. (cf. Fig. 9). In the pre-war and war period an extremely high rate of mortality prevailed. Five years after discharge the percentage was as high as 60%; twenty years after discharge it was nearly 90%. During the intermediate period, from 1920-5 the mortality rate is about 10% lower; and in recent years 1930-4 it is lowered by quite 20%.

Graph demonstrating the mortality of cases (tubercle-positive on admittance) discharged from the Midhurst Sanatorium in the years 1910, 1915, 1920, 1925 and 1930-1932 (calculated from Midhurst Annual Report, 1936).

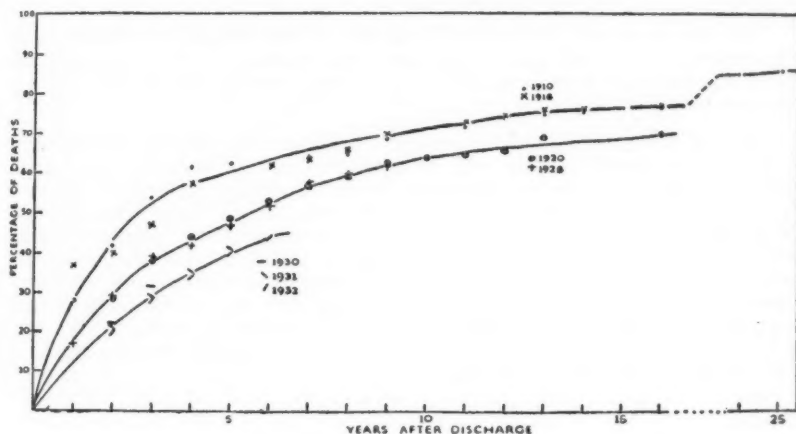


Fig. 9

The percentage of the different stages of the disease did not alter very considerably during this period; and so this factor cannot be held responsible for the decreased mortality. If anything there is an increase in the number of advanced cases as the

years go by. The change in the type of case may be gathered from a study of the accompanying table :

RATIO OF CASE-TYPES : $B_1 : B_2$ and $B_1 : B_3$.

								B_1	$B_1 : B_2$	$B_1 : B_3$
1910	..	..	..	..	..	..	..	I	2.2	1.2
1915	..	..	..	..	..	..	..	I	4.4	4.2
1920	..	..	..	..	..	..	..	I	1.4	2.0
1925	..	..	..	..	..	..	..	I	4.2	5.2
1930	..	..	..	..	..	..	..	I	5.5	1.0
1931	..	..	..	..	..	..	..	I	8.2	3.3
1932	..	..	..	..	..	..	..	I	7.1	2.0
1933	..	..	..	..	..	..	..	I	2.9	2.6
1934	..	..	..	..	..	..	..	I	5.9	4.9

In the Midhurst Sanatorium also, collapse therapy and modern clinical treatment have developed greatly in the period covered by the records. Here the number of positive cases discharged as sputum negative at the end of treatment increased from 23.2% in 1924 to 44% in 1935.

From the material provided by the records of the working class sanatoria of Friedrichsheim and Luisenheim (for men and women), Münchbach made a comprehensive analysis of the after-history of 9,741 sufferers from pulmonary tuberculosis who were discharged during the years 1920-1927. The bulk of these statistics refer to a period of about ten years ago and some to even more remote years. Even in those days there was a progressive decrease in the mortality, although the proportion of +— cases did not exceed 30%.

The decrease is not very marked in the case of men though still amounting to 15% between 1920 and 1925-6 (3.4 years after discharge). For women much greater differences are found, amounting to 20% (Fig. 10a, b). These graphs include only sputum positive cases.

We will make only a brief reference at this point to the statistics of the Sanatorium Berg-en-Bosch as they will be considered later in order to demonstrate them as an example for the adoption of a method to serve as a standard statistical analysis. Here the same phenomenon is to be observed. If we compare the two year-groups of 1925 and 1932, a difference of 18% is shown in the number of deaths four years after discharge (26% as against 44%). In Berg-en-Bosch during this period a scheme of intensive organised therapy has been introduced and this forms a special feature of the institution. The working cure and post cure have been progressing in order to consolidate the results obtained by therapy. We are, therefore, dealing with conditions which are very nearly ideal for the restoration of health in the tuberculous patient (Fig. 11).

Summary.

A statistical analysis of sanatoria patients shows an increase in survivors in the years since 1920 to an even greater degree than that shown by dispensary patients. This amounts to about 20%. This improvement in prognosis exceeds to some extent statistical predictions. As a conservative estimate it was to be expected that an improvement might result in view of the intensified treatment that has been initiated. A further increase was expected on account of improving social conditions of the patients.

Graph demonstrating the mortality of cases (tubercle-positive on admission) discharged from the Sanatorium Friedrichsheim (men) in consecutive year-groups 1919-1926 (calculated from Muenchbach's data).

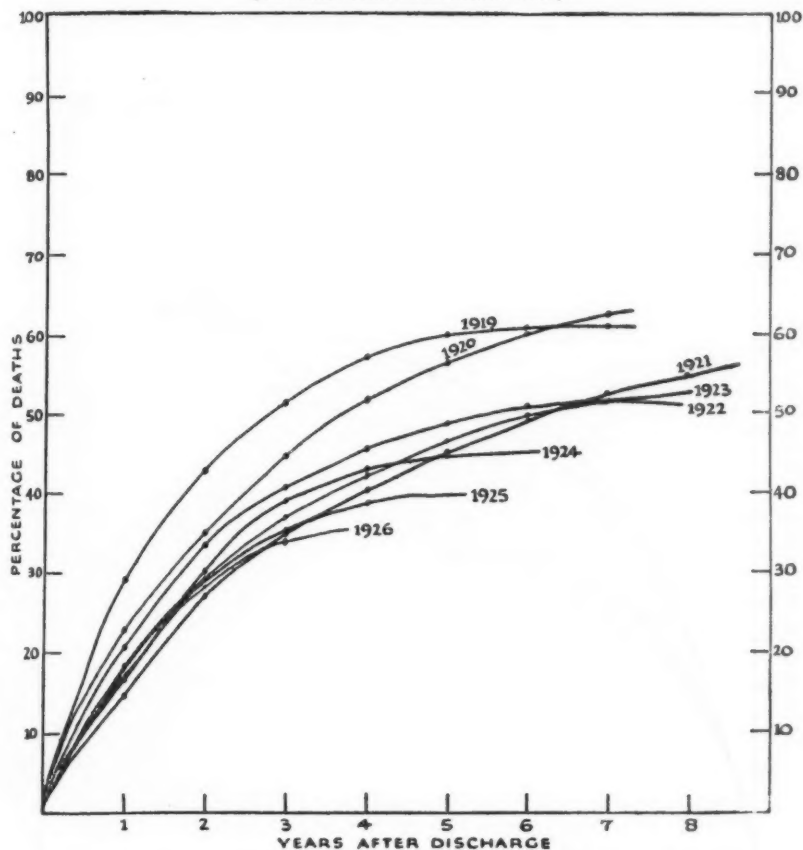


Fig. 10a

Graph demonstrating the mortality of cases (tubercle-positive on admission) discharged from the Sanatorium Luisenheim (women) in consecutive years 1920-1926 (calculated from Muenchbach's data).

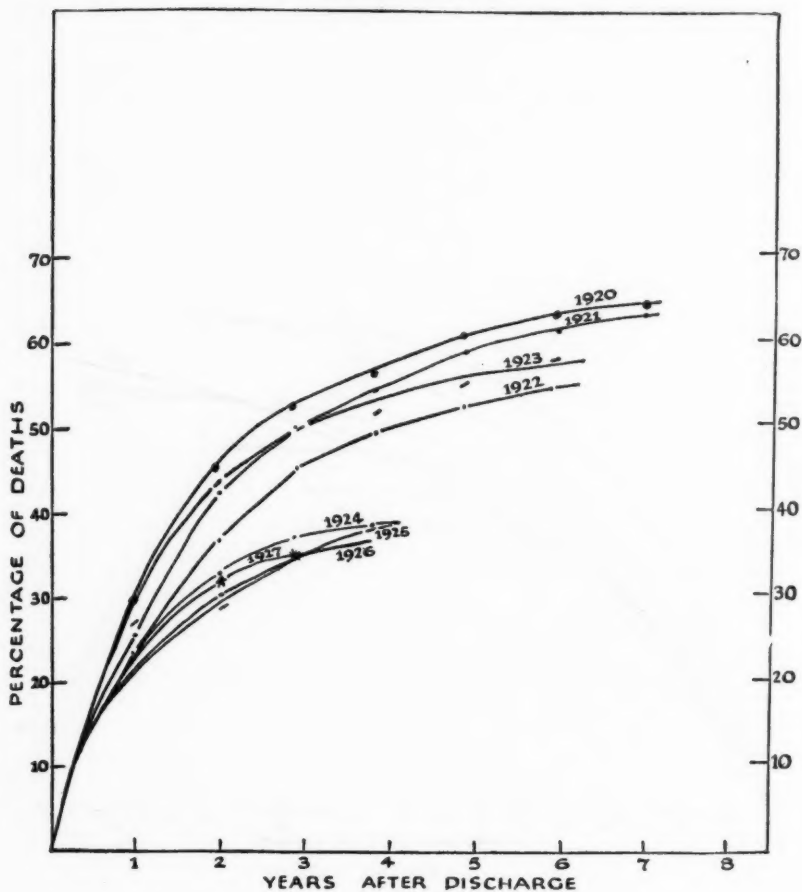


Fig. 10b

Graph demonstrating the mortality of cases (tubercle-positive on admission) discharged from the Sanatorium Berg en Bosch, Bilthoven, in consecutive years 1921-1931.

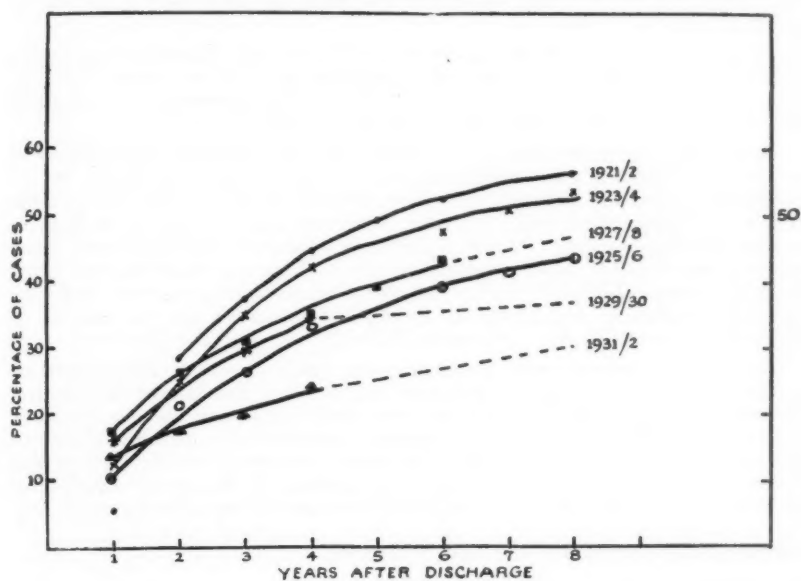


Fig. 11

CHAPTER 2.

Significance of the Increase of the Survival rate.

Before proceeding with the analysis, we will examine the significance of these facts in connection with the problem of after-care. What does this tendency to decrease of fatality mean? Does the improvement in prognosis mean only the lengthening of life *and* the period of infection? Or does it mean that an increase in the number of complete cures is being further demonstrated? In other words, how many of the survivors are healed and how many are surviving with a measure of disablement?

The prolongation of life among open cases of pulmonary tuberculosis in 11 years from 1924-34 has been demonstrated and established as a fact by Lissant Cox (23), "the duration of life of the plus tb cases in this area has increased two and a half times from 10.8 months in 1924 and 30.1 months in 1934."

Braeuning draws attention to the curious fact that although the numbers of cases newly entered on the register and removed from it owing to deaths are approximately equal, and although there is an increase in the number taken off the register as fully recovered, still the number of tubercle positive cases on the register remains almost unchanged. "This is surprising; and an additional factor must therefore enter into the question under discussion. I am convinced that this factor lies in treatment. Although we are not always successful in removing bacilli we do usually succeed in prolonging life so that both infection and the number of infecting foci are increased." (Braeuning 24).

In order to examine more thoroughly this question, which is an important one for social medicine and particularly after-care we must proceed with the statistical elaboration of the material in such a way as to divide the ex-patients into groups of those who lose their bacilli through treatment and those who remain a source of infection; follow-up these separately with regard to survival, working capacity and clinical condition in order to correlate these findings to the group-classification given by Vos (see page 9) and compare ultimate results of consecutive year groups.

Separate Follow-up of the +- and ++ case.

The after-history of the +- case.

The separate statistical elaboration of these two groups has been undertaken in a whole series of statistics since Bardswell's follow-up statistics. Among his group of patients, the expectation of life, i.e., the ratio of actual deaths to expected deaths, in plus-minus cases is more than three times as great as in plus-plus cases.

MIDHURST.

Class.	Group I		Group II		Group III		All Groups	
	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.
— —	3.7	2.5	9.6	4.2	11.6	.1	5.5	3.1
+ —	5.2	4.5	5.9	7.7	18.4	21.3	6.5	7.7
+ +	8.8	11.8	19.9	29.6	44.2	39.9	21.8	31.6

The Frimley statistics arrive at similar conclusions as those of Bardswell which are revealed in the following table:

FRIMLEY AND MIDHURST.

				— —		+ —		+ +	
				Male.	Female.	Male.	Female.	Male	Female.
Midhurst	5.5	3.1	6.5	7.7	21.8	31.6			
Frimley	4.2	4.3	8.3	12.8	28.9	42.1			

These two tables are taken from the Report of the Chief Medical Officer of Health United Kingdom (25).

The results of Frimley, expressed in terms of percentage of survivors and dead is shown in the following table (26).

				Cases	Cases	Percentage	Percentage
				Number.	Percentage.	alive.	dead.
— —	727	30.7	84.7	15.3			
+ —	575	24.3	67.0	33.0			
+ +	1,063	45.0	36.8	63.2			

This favourable prognosis for + — cases has been repeatedly confirmed. In King's statistics (Fig. 12) 70% of the + — cases were alive after 5 years, whereas hardly 30% of the + + cases were alive at the end of the same period.

The corresponding figures of the Friedrichsheim and Luisenheim Sanatoria (Münchbach) and of Berg-en-Bosch (Bronkhorst) are (27):

Mortality and Working Capacity 6 years after Discharge.

Berg-en-Bosch Discharges 1924/1926				Berg-en-Bosch Discharges 1927/1928				Friedrichsheim Luisenheim Discharges 1920/1923			
dead	full	working		dead	full	working		dead	full	working	
%	capacity	%		%	capacity	%		%	capacity	%	
+ on admittance } + on discharge }	64	20		65	18			66	13		
+ on admittance } — on discharge }	19	60		17	70			27	55		
— on admittance } — on discharge }	11	75		9	77			—	—		

Thus the group of + — cases (potential cases of healing) has a comparatively good expectation of life, and in particular, there is not a high rate of early mortality.

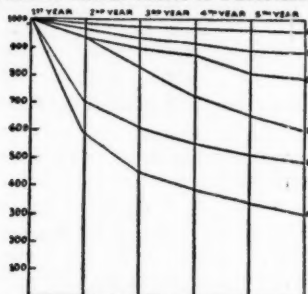
On the other hand there is a fairly strong tendency to relapse (+ — +). Of 85 cases (Braeuning), which became closed (+ — cases), 38, or 45% became open again in the course of the next four years, half of them during the first two years.

"Thus one must reckon that a large percentage of the cases which became closed through sanatorium treatment will suffer a relapse, even after some years." Of the cases which became open again, 11 or over one-third lost their sputum and again one-fifth of these after re-admission into the sanatorium. According to Oldenburg and Seisoff almost half of the plus minus cases again became positive in the first two to five years. The more intensive the cure and the after treatment, the less is the tendency of relapse.

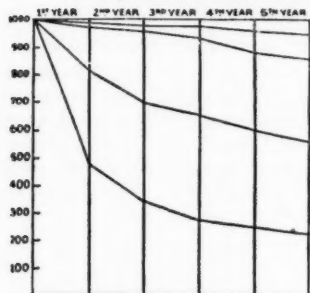
"The conditionally arrested case."

The routine classification of discharged patients does not include a definition of the plus-minus case. This group which we might describe as "conditionally arrested" is not identical with cases classified as "arrested," "apparently arrested" or "apparently healed."

Graphic Charts showing Death Curve over a period of 5 years in general population, as compared with that of various classes of Tuberculous Patients (King).

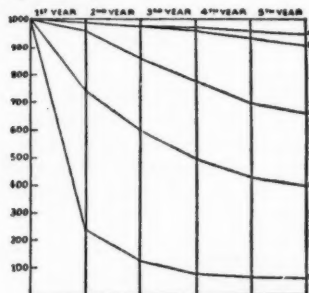


- A—General population
 B—T.B. bac. not demonstrable during residence (277 patients)
 C—Sputum changing from bacillary to non-bacillary (247 patients)
 D—Discharged with disease quiescent, but bac. sputum (239 patients)
 E—All classes combined (1,515 patients)
 F—Sputum bacillary on discharge (991 patients.)



- A—General population
 B—Incipient (256)
 C—Moderately advanced (634)
 D—Far advanced (618)

on admission



- A—General population
 B—Apparently cured (308)
 C—Arrested (352)
 D—Improved (773)
 E—Unimproved (382)

on discharge

(Reproduced from John Hopkins Hosp. Bull., Vol. 26, 1916.)

Fig. 12

The definition of a case as a plus-minus case is a definite prognostic designation upon discharge and should receive consideration as such. Up till now only the collective statistics of Switzerland, and those of a few sanatoria give the figure for the plus-minus cases at discharge. The proportion of plus-minus cases among those discharged from the sanatoria in Switzerland is given as 30% in 1924 and 50% in 1935. The quota of Tb. + cases discharged as arrested cases is given in the collective statistics for the U.S.A. as 17.5% in 1937; for Belgium 15.6%, and for Great Britain 11.3%. The quota of clinically healed cases is given in Germany as 2.5% for the same year. These data (28) may be taken as evidence of the small proportion of plus-minus cases that are pronounced as arrested under our present system of sanatorial and post-sanatorial treatment.

The after-history of the +++ case.

Open cases of tuberculosis who leave the sanatoria as open cases have according to the unanimous verdict of statistics, a very unfavourable after-history. About 70% die in the first five years. But it was early recognised that a small group of these cases had a strikingly good chance of survival, one comparing favourably with the plus-minus group. King was probably the first to draw attention to the fact that, whereas out of 991 unclassified plus-plus cases scarcely 30% were alive after five years, out of 239 plus-plus cases discharged as "quiescent but bacillary" 62% were alive after five years. (cf. Fig. 12).

Guinard has correlated this phenomenon with the number of bacilli in the sputum at the time of discharge (cf. Burnet).

PERCENTAGE OF SURVIVORS.

Classification (on discharge)	After time of onset.			After entrance to sanatorium.		
	Years.	Years.	Years.	Years.	Years.	Years.
	2	5	10	2	5	10
Bacilli constant	65.7%	27.5%	13.4%	55.3%	15.6%	7%
Bacilli intermittent	93.1%	70.9%	49.2%	80.5%	56.1%	38.9%
Bacilli, more rare	94.4%	77.7%	61.1%	86%	70.9%	56.9%

Cavities.

It has been said that a persisting cavity approximates to a death sentence (Graeff); but according to recent statistics this is not necessarily the case.

The prognosis of cavities varies according to the factor of diagnosis: either clinical or X-Ray. Barnes stated that of those cases where a cavity was clinically diagnosed, 5% are still alive after five years, while those diagnosed by X-Ray, 21% were alive after a corresponding period of time.

According to Braeuning, about 10% are alive after a period of ten years. O the 90% dead 70% were already dead at the end of the first five years; and 60% in the first three years.

Among cases of cavities, a group can be distinguished where the cavities are small, fibrous and less active: these show a considerably improved and more favourable prognosis than the average cavity case group. According to Barnes, out of 122 cases of cavities under 2 cm. in diameter, 31% were still alive after five years. "Even independently of the extent of the disease, the size and number of the cavities is of prognostic importance." In this connection, Braeuning introduces the following table:

INFLUENCE OF THE SIZE OF CAVITIES.

Size of cavities (cm.)	No. of cases.	Condition after four years.		
		Closed.	Open.	Dead.
1	22	8	7	7
2	55	20=36%	12=22%	23=42%
3	81	23=28%	17=22%	41=50%
4	34	9=26%	10=29%	15=45%
5	45	4=9%	7=16%	34=75%
6-10	30	1=3%	7=23%	22=73%

Late healing of cavities has been recorded (Courcoux, Deist); but exceptional cases have been observed where "patients are discharged with all the signs of

a cavity, take [up full] time work immediately and come back to the sanatorium after some years, their cavities healed, for another short cure, which seems unnecessary according to our present views" (Deist).

Activity.

The temperature of the patients and especially the pulse rate are important criteria for the prognosis of cavities. A group where temperature is normal and the pulse rate between seventy and eighty has a comparatively favourable prognosis, whereas when the pulse rate is over eighty the prognosis is extremely unfavourable. (Barnes). One of the main symptoms for prognosis is the sedimentation rate.

THE INFLUENCE OF THE SEDIMENTATION RATE ON PROGNOSIS

(Braeuning and Neisen.)

Sedimentation.	Number of cases.	Condition after four years.		
		Closed.	Open.	Dead.
0-10	59	26=44%	22=37%	11=19%
11-20	82	34=42%	26=32%	22=27%
21-30	113	31=27%	40=35%	42=37%
31-40	97	18=19%	28=29%	51=52%
41-50	90	17=19%	16=18%	57=63%
51-60	57	7=12%	7=12%	43=76%
61 and over	70	2=3%	7=10%	61=87%

Braeuning combined the effect upon prognosis of the size of the cavity and the sedimentation rate; but much more important than this, is the combination of the sedimentation rate with plus-plus and plus-minus sputum records on discharge.

Trail followed up for two to six years the after-history of 500 cases discharged from the Midhurst Sanatorium, which were classified according to X-Ray findings, sputum records and sedimentation rates. Of the cases in question, 216 were plus-plus and 146 were plus-minus cases.

THE INFLUENCE OF SEDIMENTATION RATE ON THE PROGNOSIS OF PLUS-PLUS AND PLUS-MINUS CASES.

Sedimentation Rate. mm.	TB. Plus on admission TB. Plus on discharge			TB. Plus on admission TB Minus on discharge		
	Alive.	Dead.	Total.	Alive.	Dead.	Total.
10	34=87.2%	5=12.8%	39	67=95.7%	3=4.0%	70
20	39=70.9%	16=29.1%	55	33=71.7%	13=28.3%	46
30	23=48%.0	27=51.9%	52	13=75.0%	5=25.0%	18
40	33=47.1%	37=52.9%	70	7=	3=	10

From this table it appears that plus-plus cases with normal sedimentation rate have an even better prognosis than plus-minus cases, with a sedimentation rate of over 10 mm., at least as far as the first two to six years after discharge are concerned. Where the sedimentation rate is slightly greater (10 to 20 mm.) the prognosis in both groups is approximately the same (71% survivors). Where the sedimentation is over 21 mm., 50% of the plus-plus cases and 25% of the plus-minus cases died, during the first two to six years after discharge.

The Good Chronic Case.

General medical experience and statistics, both point to the fact that a group of open cases, which have failed to respond to treatment have a fairly good chance of survival. This group can be defined by a series of symptoms. Surgeons have

observed that in a special group of chronic cases, the prospects of successful thoracoplasty are particularly good. Lawrason Brown and Sampson describe this group as "good chronic cases." They define the group thus: "A cavity, two centimeters in diameter or larger, must be present. The general condition must be favourable. The temperature and pulse must be normal during the period of observation of several months. The appetite and strength must be good and the patient must sleep well. Expectoration may be present but must not be excessive. He is usually able to take some exercise. The number of tubercle bacilli in sputum is not taken into consideration . . . A patient not conforming to these criteria, would have to be classified as a "bad chronic," but it is evident that this is a broader group and will embrace many more patients than the former, and indeed, as we have already intimated, it might be wiser to form an intermediate or slipping group" (29).

The expectation of life in the group of "good chronic" cases, which includes 205 cases in Lawrason Brown's material is even greater than that found by Münchbach, King and Braeuning in the group of benign plus-plus cases.

After five years 80% had survived; and after ten years 66%. After five years 54% were at work; and after ten years 52%. The state of health in the "good chronic" case, who is working, remains fairly constant, therefore, over a period of ten years. Of the bad chronic cases on the other hand, only 37% were still alive at the end of five years and 25% at the end of ten years.

These figures show that a good chronic case, who has worked for five years, has the prospect of some five years' more work; but even a bad chronic case, who is at work after five years, has a prospect of a further five years' work, for of the 12% bad chronic cases who were at work after five years, 90% were still at work after ten years.

The surviving chronic case is equivalent to the "middle case" (Varrier-Jones 30), such an individual constitutes a permanent source of infection, failing to respond to treatment and remaining permanently disabled. Such a case may be regarded as a cripple, who, having survived a serious illness for years, has now to face the lack of social and economic security.

Sanatorium treatment has no material effect on the course of the disease in plus-plus cases. The mortality graph of open cases discharged from the sanatorium before a residence of six weeks had been completed, is, according to Münchbach, identical with that of the open cases discharged after a prolonged stay in the sanatorium where the sputum remained positive.

On the other hand, experience has shown that permanent after-care, in that it raises the standard of general hygiene and living conditions, has a very great influence on the survival of the middle case. So far, no statistical proof of this is available; but the experience of after-care colonies and village settlements leaves no doubt as to the question of the prolongation of life and this can result only from the sheltered environment existing in such colonies and settlements.

Analysis of Follow-up Statistics of consecutive year periods with a view to Prognosis.

Unfortunately, most statistics have not been completed in such a way that the composition of the ex-patient material discharged from sanatoria in consecutive years could be controlled with regard to life expectancy, economic efficiency and infectivity in the post-sanatorium period; but they do give some idea of methods which should be used in investigating such problems. What is required is the individual consideration of survival and efficiency in consecutive year periods—

when the plus-minus group is steadily increasing and their intensive following up, taking into account not only the mortality but also the clinical and social status of the survivors.

The position in 1920-1927.

Only the statistical material presented by Münchbach can be interpreted on these lines. The condition of patients in 1929 is known for each year-group 1921-27: i.e. the condition of the year-group for 1927 is established two years later, that of the 1926 group, four years later, and that of the 1920 group nine years after discharge. Such methods do not actually constitute, naturally, a perfect continuous record. The following-up of a year group year by year for nine years, and the assessment of the condition of the different year-groups after two, three and nine years are two entirely different functions, because the graph of mortality for the separate years and year-groups is not identical as one will see from a study of the graph. (Fig. 10a, 10b.)

If we tabulate Münchbach's figures (Fig. 13) we see that the final results are considerably influenced by the shifting of the proportion of plus-plus to plus-minus cases. In the year-group 1924 for instance, only 16% of the discharged were plus-minus cases. After five years there survived 23% as permanent plus-plus or good chronic cases with full working capacity; and 9.2% as plus-minus or arrested cases.

Compare this with the figures of the year-group 1922, where the proportion of plus-minus cases was 32% at discharge and 13% survived as plus-minus cases with full working capacity. In all the year-groups where the quota of plus-minus cases is low, the proportion of plus-plus cases with full working capacity shows a preponderance as time goes on. If the plus-minus quota becomes larger, the stabilised arrested case increases *pari passu*. But the best proportion of arrested cases to good chronic cases ever obtained in Münchbach's statistics is 1:1.

In the year-group 1927, checked up two years after discharge, there is a very high quota of plus-plus cases described as incapacitated. In the year-groups the further back they date, the more the group of incapacitated is reduced by death, until, finally, nine years after discharge (year-group 1920) only 2.6% of the incapacitated are left alive.

Something similar can be noticed among the plus-minus cases here, two years after discharge (year-group '27) there is a large number of fully or partially incapacitated (9%). There is only a small number (3.8% in the year-group 1920) nine years after discharge. The number of dead has risen from 2.3% to 10%. If we plot a graph (Fig. 14) from Münchbach's data on the assumption that one year-group (1921) has been followed up for two, four, six and nine years after discharge, the following facts are disclosed:

After two years, 36% of those discharged (+ +) are still incapable or partially capable of doing work; 15% are good chronic cases with full earning capacity. Thus 51% of those discharged are still infectious and in need of care and only 15% survive as plus-minus cases. Even after only two years the number of relapses is considerable as is shown by the shading above the white lines on the graph (about 10%). 30% are dead.

After nine years, all those who were described as fully or partially incapacitated have died. The good chronic cases have decreased by about 5%; the arrested cases also by 5%; and thus at the end of the nine years there remain, out of the total number discharged, some 10% of definitely arrested cases and 10% of stabilised good chronic cases. There is also a very small quota of incapacitated cases and others with partial working capacity. This graph gives an approximate picture of the condition of those discharged from sanatoria ten years ago and more.

To sum up, after two years 30% had died and 51% were disabled simply because they were infectious. Almost two-thirds of these disabled and infectious cases died in the subsequent nine years; and their lives were one continuous round of sanatoria and hospitals.

This is why the sanatorium system lays itself open to serious criticism; and it is on this account that a system of tri-partite care and after-care, the Papworth Scheme, has been so strenuously advocated. In such a scheme there are adequate facilities for dealing with those disabled on account of infection as well as with those incapacitated by the continuous progress of the disease.

Table showing the clinical and social condition in 1929 of cases discharged in consecutive years 1921-1927 who were tubercle-positive on admission and became tubercle-negative or remained tubercle-positive at discharge (calculated from Muenchbach's data).

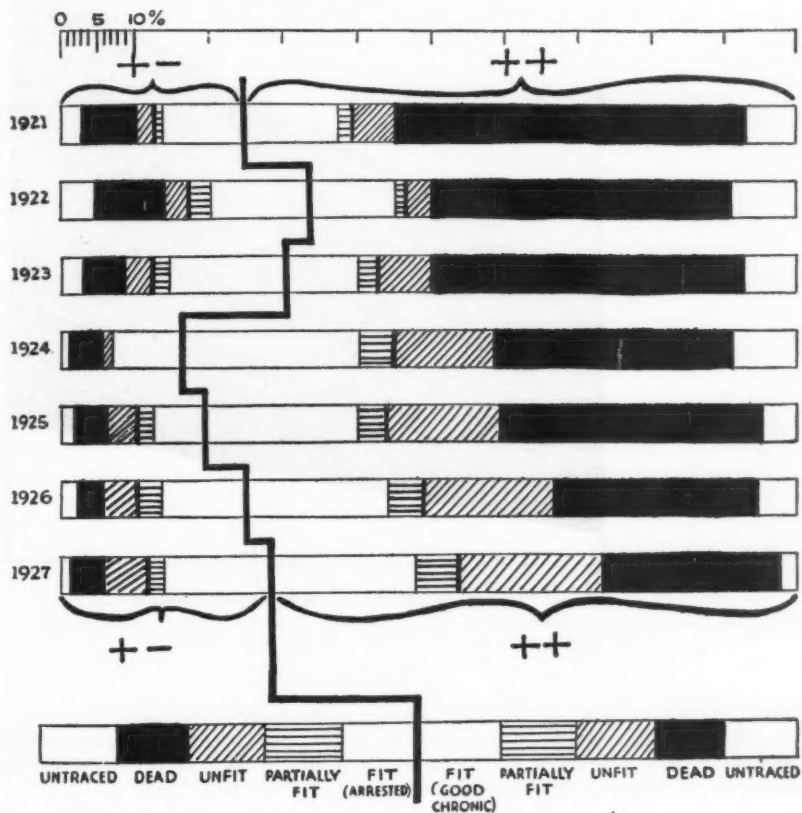
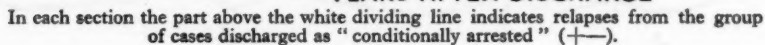


Fig. 13



Change from 1921-1925 to 1930-1932 according to the Bilthoven statistics.

* The figures in the graphs (Fig. 15 and 16) do not exactly correspond, as Fig. 15 was constructed from only recently revised values. But the differences are insignificant and do not in any way affect the status of the arguments in this chapter.

Each year-group has been checked up year by year as regards condition and social status, only 2% of cases being untraced. The statistics begin with the year-group 1921-1925, and finish with the year-group 1930-1932. In order to have sufficient material at our disposal we will group the different year-groups into three periods, 1921-25, 1926-29 and 1930-32. During this time the quota of discharged +- cases changed from 34% to 66%. We will only discuss the two extremes, the period 1921-25 with 34% discharged as +- cases and the period 1930-32 with 66% discharged as +- cases. (Fig. 15 a, b.)

The material is divided into cases which were +- on discharge and cases which were ++ on discharge. The clinical and prognostic condition on discharge is further characterised as Result I=good, Result II=moderate, Result III=bad; and on follow-up as good = full working capacity, moderate = partial working capacity, and bad = incapable of work. All these points are shown on the graph.

The cases could, of course, be defined more accurately from the clinical and prognostic standpoint (by sedimentation and other symptoms), but in the interests of compression we must not attempt to include more than the minimum data necessary for the present enquiry.

The material for the years 1921-1925 has been followed up for two, four, six and eight years; in the whole ++ group 70% died within the eight years under observation i.e. 45.9% of the total number discharged. Of the 25% which were marked "bad results" on discharge all died within two years: the prognosis was thus 100% accurate. The latter cases are therefore purely hospital cases.

The 20% of ++ cases discharged with "moderate results" lived considerably longer, two-thirds of them dying after four years, the remainder after six years of illness. The prognosis was thus too optimistic as regards the ultimate results, but quite justified, as it is probable that a very considerable proportion of these cases could exercise their working capacity during these years, and would probably have exercised it longer had the environmental conditions been good.

Of the 21% of the ++ cases discharged with "good results," one-fifth was after two years, either incapacitated, or only partially capable of working. But after eight years almost all these cases were still alive, and all those with full working capacity after two years were still capable of working after eight years, although some only partially so.

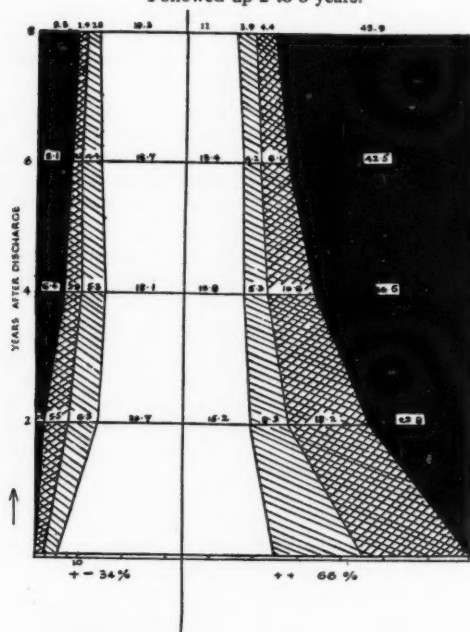
One can assume with more or less certainty that the "good chronic" who, two years after discharge, are still fully capable of working are stabilised to a certain degree. It is fair to assume that very few of those discharged with moderate or bad results will join the group of those stabilised. The prognostic position of the ++ cases is clearly defined after two years; the cases which were recognised from the beginning as being weak (labile) and doubtful, gradually die off. The group of the good chronic cases is fairly large and at the end of eight years it still consists of about 12% of the total number of those discharged. The group of the tubercle positive cases who are fully or partially incapacitated has shrunk to a small percentage by the end of eight years.

These results are almost identical with those reached above by a study of Münchbach's figures.

As far as numbers alone are concerned, the group of the +- cases plays the smaller part in 1921-25. On discharge they are judged with comparative optimism. Those discharged with bad results (2%) had died by the end of two years, those with moderate results (3%) by the end of four years. Two-thirds of this group (about 20% of the total) are alive at the end of the period of eight years. But of

Follow-up analysis of patients discharged from the Sanatorium Berg en Bosch, Bilthoven (showing the different after-histories of the +— and ++ groups)

A: The Year Group 1921-1925.
Followed up 2 to 8 years.



B: The Year Group 1930-1932.
Followed up 2 to 4 years.

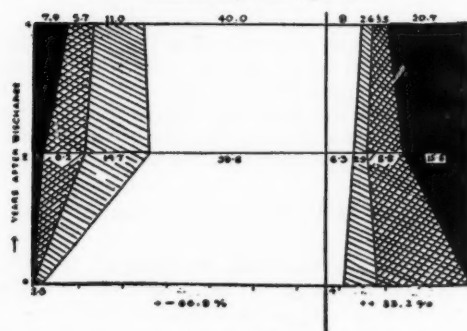


Fig. 15a and b.

these about 5% have become partially or totally incapacitated, and in fact they became so in the first two years after discharge.

Here, too, the relapses, which represent about one-third of the $+-$ cases take place in the first two years after discharge. Here, too, we see that the $+-$ group pronounced stabilised at the end of the two critical years following the sanatorium treatment continues in this condition.

With the $+-$ group, the essential function is to stabilise the results and to bridge over the period of relapse. But this period of relapse is in the majority of cases restricted to about 2—4 years. It is definitely of a temporary nature. For the group of stabilised $+-$ cases (arrested cases) which regain and retain their full working capacity after two years—about 19%—do indeed require a certain measure of protection, and sheltered employment, and this degree of sheltered employment should be obtainable in the open labour market.

The number of those who survive but are not capable of working ($++$ group) is fairly small, and the percentage of those with partial working capacity is no more than 2%.

These cases which fail to respond to treatment and after-care ($++$), but which still survive with partial working capacity after eight years, increase the group of good chronic cases with partial working capacity who survive after eight years, though only by a very small percentage.

During the period 1920–1925 the position is as follows: 50% of the TB. plus tuberculous were discharged with unsatisfactory results: another 25% are open cases whose prognosis is indeed more favourable but who remain open cases. Only 25% were $+-$ cases discharged with a favourable prognosis.

Two years after discharge the outlook has altered considerably: about 35% are still only partially capable or incapable of work—of these 30% are $++$ and 5% $+-$ cases (as opposed to 36% in Münchbach's material), 15% are about good chronic cases (15% in Münchbach's material) and therefore have their full earning capacity. Thus over 50% are infectious after two years (51% in Münchbach's material). 15–20% have become stabilised $+-$ cases (arrested cases), (15% in Münchbach's material).

After nine years all of those who at the end of two years were found incapable of working, had died. Those partially capable of working after two years were all alive at the end of nine years. Of the latter only one-third are partially capable of working, the rest are incapable of working. The good chronic cases have maintained their state of health, as have the arrested cases.

In the year-group 1930–32 of the Bilthoven material, the proportion of the $++$ and the $+-$ cases has altered considerably. There are now 66.6% of $+-$ cases and 33.4% $++$ cases.

The first glance at the figures is enough to show that the problem of the $++$ group no longer occupies such a prominent position. The number of deaths so far as the $++$ group is concerned is during the first two years considerably lower (15% as against 23% of the total). After four years, 20% against 40%. There is no material change in the percentage of deaths in the $++$ group.

The prognosis on discharge is much more cautious this time. Of those discharged with bad results 3.5% are still alive after four years, though all are incapacitated. Of the $++$ cases discharged as partially fit (about 8% of those discharged) almost all are still alive, and some of this group have even become stabilised and have regained their full working capacity.

Two years after discharge two-thirds of those incapacitated had died and one-third were partially fit or unfit. At the end of this period a group of stable open tuberculous cases had been formed, but this group only comprised 6% of all those discharged.

After four years 14% of those discharged survive as chronic infectious cases and 8% as good chronic cases, fit for work (as against 30% or 14% of the first group).

In the $+-$ group, the increase in potential cases of healing results in a real increase in stabilised cases. The proportion of stabilised cases to relapses is, after four years, 1.6 : 1 (as against 1 : 1 in the 1921 period).

In spite of the more favourable quota of relapses, the absolute figure and the quota of relapses in relation to the total number discharged is of course fairly high at present. These relapses are observed in the first two years after discharge (altogether 25% of those discharged suffered relapses: 2.5% died, 10% were incapacitated and 15% became only partially fit for work).

The prognosis of this $+-$ group on discharge was conditional. Of those discharged as fit, nearly half relapsed within the first two years. The 2.5% discharged as unfit (with a bad prognosis) had died after two years.

After two years the group of stable $+-$ cases (arrested cases) was formed, and it continued unchanged for the next two years.

Thus the number of stabilised $+-$ cases has been almost doubled.

CHAPTER 3.

The Three Functions of Aftercare.

With 70 to 80% of \pm cases on discharge, clinical and surgical treatment seems almost to have reached the optimum with regard to immediate results. The next step must be, through intensive temporary after-care, to maintain this gain and reduce the number of relapses. But for those cases in which this result can be maintained only through permanent after-care, the temporary after-care should serve as a transition to this latter.

If we construct a graph (Fig. 16 a, b) from the data tabulated in Fig. 15 a, b by grouping the different classes together in accordance to their fitness to work, state of recovery and infectivity, we get a fairly accurate account of the composition of the expatients material and we can easily compare the results of treatment with regard to survival, recovery and disablement.

Graphs constructed from Fig. 15 demonstrating the clinical and social status of the year-group 1921/25 and 1930/32 discharged from the Sanatorium Berg-en-Bosch and followed-up every two years.

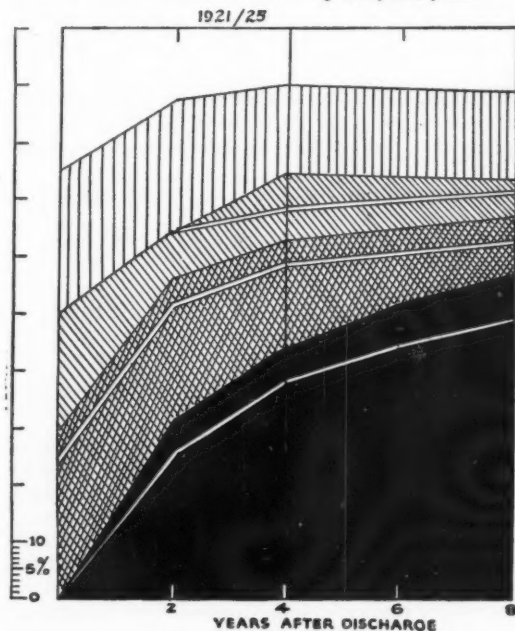


Fig. 16a

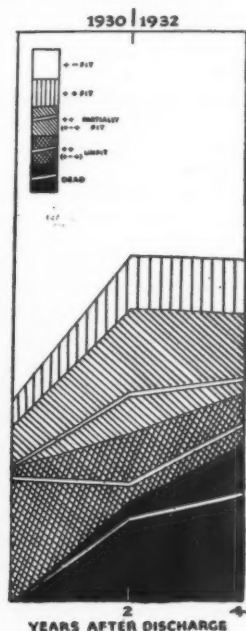


Fig. 16b

(cf. note to Fig. 14 for further definition of white dividing lines on graphs.)

The social-hygienic and sociological function.

With regard to the functions of after-care and their changes from 1920 to 1930, social medicine can draw the following conclusions:

For the TB. + cases sanatorium treatment is nothing more than an attempt to convert the open case of tuberculosis into a closed one—an attempt which too often we know to be a forlorn hope after the first few weeks of treatment. Here, after sanatorium treatment has done its best, after-care takes its place. After-care has therefore the following functions to perform with regard to plus-plus cases:

(a) A purely social-hygienic function—the hospitalisation of the group which dies within two years. Even in 1932 this problem is still an important one though the number of patients in this group has diminished.

(b) A function at once medical, social-hygienic and sociological; the institutional segregation of the surviving group with the purpose of prolonging as far as possible the lives of the weak (labile) cases, ensuring their livelihood during the long years of disablement and at the same time preventing infection from spreading during this particularly dangerous period. In 1932 this group forms a relatively small quota (10%) as opposed to 30% in the earlier period.

(c) A sociological function: vocational rehabilitation of the group of those who are in themselves fully capable of work, but cannot secure their livelihood without running the risk of harming both themselves and their environment.

Thus after-care has no essential curative but rather a palliative function to perform in this group even though under medical guidance and advice the condition of health can be considerably improved, life prolonged, and working capacity utilised.

For the +— cases which fail to respond to treatment and after-care treatment (+—+), after-care has the same function as for the ++ cases: the social-hygienic and sociological function of permanent institutional segregation and vocational rehabilitation.

Four years after discharge the group of the ++ and +—+ cases (the middle cases) is composed of:

						1921/25 %	1930/32 %
+—+	Unfit	..	..	..	..	3.9	5.7
+—+	Partially fit	..	..	..	..	5.3	11.0
++	Fit	..	..	..	..	13.8	8.0
++	Partially fit	..	..	..	..	5.3	2.6
++	Unfit	..	..	..	..	10.6	3.5
Total						38.9%	30.8%

The hygienic and sociological problem of permanent care of chronic infectious cases thus remains of considerable importance in spite of the great strides made by therapy. In fact, as a result of active therapy, this problem becomes even more urgent, as the numbers of semi-healed cases increase in parallel with the numbers of healed. Thus the statistical analysis explains the statement of Braeuning that the number of cases of open tuberculosis on the register has not yet diminished and makes it very probable that it will not diminish for a long time.

The group of middle cases, which present a social-hygienic and sociological problem still constitute almost one-third of all those discharged from institutions. At least 30% are still "both medical and economic responsibilities to the nation" (Report Employment Committee).

The social-therapeutic function.

Ten years ago, the problem of institutional segregation and hospitalization and the sociological problem of provision of an economic livelihood for the middle case predominated. After-care was a social-hygienic and social economic problem. Its social therapeutic function consisted mainly in prolonging the life of a group of infectious cases for whom institutional segregation had at the same time to be provided. In the period beginning with 1930, the sociological economic problem does not become less serious, but the social therapeutic element in treatment and after-care acquires new importance, as therapy expands its activities.

To begin with, it is noteworthy from the standpoint of hygiene that the proportion of $+-$ cases stabilised to $++$ cases stabilised (four years after discharge) is in 1921-25 18 : 14 or almost 1.3 : 1, and in 1930-32 40 : 8 or 5 : 1.

In treatment and after-care, the function of social therapy predominates. For the increasing $+-$ group after-care is temporary and confined to a period of about two years; and its function is the prevention of relapses and the consolidation of the results obtained through intensified treatment, the fullest utilisation of all possibilities provided by therapy for potential cases of healing. Thus after-care enters into direct relation with therapy, and furnishes the auxiliary organisation which alone can ensure the final success of treatment.

There is no doubt that the combination into a single organisation of modern therapy with temporary after-care, will raise perceptibly the number of effective cures.

A social-therapeutic index.

The Bilthoven-Scheme where intensive treatment and temporary after-care has already been put into practice for some considerable time, shows an exceptionally high proportion of $+-$ to $++$ cases, a proportion which is not yet reached by all sanatoria. But the general trend is in that direction.

In Münchbach's statistics the proportion of the $+-$ cases varied from 16% to 30%. In the pre-war material the values corresponded approximately to those of Münchbach. On an average, the figures given hardly reached 30%.

Name.	Year.	I. %	II. %	III. %	Total. %
Hamel	1902	65.0	34.0	15.0	
Bardswell	1906	38.8	21.1	3.6	
"	1915	60.0	22.4	5.0	
Münchbach	1920-27	55.6	38.9	18.0	
Ulrici	1922	43.6	28.6	12.0	
Kayser-Petersen	1926	75.0	36.0	24.0	30.0
Frimley (Males)	1905-14	29.0	25.2	6.0	21.5
" (Females)		19.4	22.9	9.5	19.2

To-day a number of institutions run on modern lines show considerably higher figures (though here the different methods of selecting the material make accurate comparison difficult).

A survey of annual reports of many sanatoria in different countries reveals the fact that the number of $+-$ cases increased more or less suddenly about 1930 and reached on the average the figure of 50%. Naturally there will always be institutions which are so managed that their results will be well above the average, and this

tendency is augmented as their high reputation soon causes them to become centres of specialised treatment for wide areas. On the other hand, there will equally be institutions, such as suburban tuberculosis hospitals, which are so encumbered with material fit only for hospitalisation that the number of the $+$ — cases is comparatively low.

The Swiss statistics for sanatoria published in 1924 give the following figures :

"Of 12,450 patients those who had bacilli in the sputum were :

On admission, 5,600 persons 45%

On discharge, 4,174 persons 34%

Thus, of 100 patients who had, on admission, bacilli in the sputum, 75 retained them and only 25 are free from bacilli on discharge." (32).
In 1935 the equivalent statistics show the following figures (33).

Of 3,383 patients admitted into the sanatoria, 1,733, or 51.2%, had positive sputum on admission. Out of these on discharge the following results are reported :

No sputum records.	Without bacilli.	With bacilli.
309 = 17.8%	576 = 30.3%	898 = 51.9%

The figures for Switzerland are the only comprehensive figures at present available which show the proportion of $+$ — and $++$ cases throughout a whole country. They show that the improvement in social-therapeutic methods has its effect even upon the average figures for a country. The $+$ — quota among patients at discharge could be considered as a social-therapeutic index to the standard of treatment provided that the sputum investigation could be standardized. Such a scheme could be further developed if a general follow-up scheme considering at least the condition of each year-group separately during the danger-period of 2-4 years could be adopted.

Conclusions.

As therapy becomes successful and as the quota of plus-minus cases discharged from sanatoria is increasing; and the opportunities for survival increase, after-care becomes the indispensable complement of a system of therapy.

After-care is an essential part of sanatorium organisation, and indeed a duty to fulfil the purpose of sanatoria. Clinical sanatoria and tuberculosis hospitals need a system of temporary after-care which must be closely connected with them as regards organisation. The sociological function, that of ensuring a livelihood to the permanently disabled cases, which fail to respond to treatment and after-care, is not yet a duty imposed on sanatoria. How far a sociological scheme is incorporated in this system will depend upon circumstances. In the Papworth Scheme, on the other hand, the provision of an industrial settlement, ensuring a livelihood for those semi-healed and "permanently disabled" is combined with efficient therapeutic treatment.

In the early days of the after-care movement emphasis was laid entirely on temporary after-care and vocational rehabilitation, but a reform of the whole system was necessary in order to find a permanent solution to the problem of the livelihood of the chronic tuberculous, and it is to the realisation of this fact that the Papworth Scheme owes its existence.

APPENDIX.

The after-history of the TB. minus cases was neglected in this study. After-care is quite as grave a problem for this group of — — or — + cases as for the group of TB. plus cases. But the diagnosis of closed pulmonary tuberculosis and the distinction between the separate aspects of the disease which are comprised under the collective term "closed tuberculosis" are as yet so uncertain that the available statistical material can hardly be utilised. By closed pulmonary tuberculosis we may indicate a variety of conditions, e.g., errors in diagnosis, healed inactive forms, minor focal lesions, hæmatogenous out-spreads, and finally the pre-phthisical forms of development which are so important for the pathogenesis of tuberculosis. With systematic X-Ray investigations of contacts there is an increasing number of cases in which we catch tuberculosis during its incipient development, though it is still a vexed question how we are to arrest it at this stage. We are probably more helpless against pre-phthisical development than against manifest phthisis. On the other hand, although one cannot, by prophylactic treatment in preventoria prevent the development of phthisis, one can at least establish the date of the outbreak of phthisis immediately it has become manifest.

The entire problem has been so little studied from the clinical and sociological standpoint, that in these cases *prophylactic* care constitutes a similar problem to the *after-care* of manifest phthisis.

PART II. SOCIAL REHABILITATION.

CHAPTER 1.

The Tuberculous as Wage-Earner.

"Broadly speaking there are two aspects of rehabilitation: one is removing the physical disability if possible. The other is making the disabled person a functioning economic unity. The first may be called physical rehabilitation, the second vocational rehabilitation. Where complete physical rehabilitation is possible, vocational rehabilitation is, of course, unnecessary. However, when complete physical rehabilitation is not possible the only recourse is vocational rehabilitation" (Dodd 34).

To re-establish earning capacity through "physical" rehabilitation is "la raison d'être" of social medicine and the ultimate goal of social legislation in all countries. But, as a rule, no provision is made for "social or economic" rehabilitation through the utilisation of the sub-standard labour of the disabled. Where this is done by legislation (U.S.A.) or by private initiative the TB. plus and still active cases who really need economic rehabilitation are not included.

In disablement through disease social legislation (or special tuberculosis legislation) provides compensation only for the totally disabled. The amount is fixed by law. It is often so small that in practice every tubercular person who is capable in any degree of earning some money prefers to do so. Even the doctor is inclined to take risks with the patient's health so that his economic life may not be endangered.

At a time when open cases which baffled all treatment constituted the majority of those discharged from sanatoria these were mainly described in the statistics of the sanatoria as "wholly or partially fit for work"; they were discharged from the institution, but no attempt was made to deal with the problem of whether this hypothetical earning capacity could in fact be realised.

To-day when this class of open case no longer predominates among the discharged the statistics of the sanatoria usually describe open cases that have been discharged as "unfit for work" although some of them are perfectly capable of earning and would prefer work to a small pension.

It is a fact that those discharged from sanatoria, whether they be open or closed cases, begin to work as soon as they find an opportunity of doing so, as far as their social position requires and their state of health permits it. The great majority of those who survive the first critical years work as long as they can obtain employment. It is estimated that 50% of those discharged from sanatoria find their way back to some occupation (Drolet; IV Report Employment Committee). The tuberculous are thus by reason of their large numbers a real problem in the economic life of the state.

From a questionnaire drawn up by the dispensary Berlin-Neu-Coelln (thirty thousand inhabitants) and addressed to its patients, the following figures were obtained (1924) :

	Active tubercle- positive cases.	Active tubercle- negative cases.
(a) Fit for work and working	..436=40%	841=76.0%
(b) Fit for work but unemployed	44= 4%	82= 7.3%
(c) Unfit for work	..651=59%	214=19.4%

There were wage earners from all the active cases (open and closed) ;

Those who lived on their earnings	..	..	62.7%
" " " on earnings and pensions	..	..	23.19%
" " " entirely on pensions	..	..	13.82%

The invalids who had to live entirely on pensions had an extremely low standard of living and in spite of all efforts the dispensaries were not in a position to create a suitable standard of living. In the families of the dying, conditions of living were still worse.

In 1929 the dispensary of Berlin-Neu-Coelln gave information with regard to sixty-seven open cases (14 bakers, 4 cooks, 4 waiters, 4 kitchen maids, 3 hairdressers, 3 butchers and 3 domestic servants) who by their employment endangered those around them. Forty-eight of these cases were persons between 15 and 40 years of age.

"The dispensary has not once had the good fortune to bring about a change of occupation . . . the assumption cannot be wrong that the protection of the endangered occupations has not yet been established by law owing to lack of means . . . A general institutional segregation of such cases as might carry contagion is impossible. The tubercular patient who is capable of working and whose disease follows a mild course cannot be deprived of the right to work and the activities of normal life." (Zadek 35).

From the statistics of past years it appears that the majority of the tuberculous who survive the critical years are at work. Stadler (36) established this as early as 1903.

Among 49.6% of the ex-patients of the sanatorium of the German Railway Workers' Insurance surviving after five years, there were 37.5% at work and 62.5% unfit for work (Oldenburg and Seisoff).

Of 65% of former patients of the King George V. Sanatorium, Godalming, surviving after four years, all cases being taken together, 54% were doing full or ordinary work or were engaged in some new occupation and 46% were unfit for work (Brooke).

Of 56% of survivors with open pulmonary tuberculosis 48% were fit for work and at work ; 52% were living, but unfit for work.

Out of 54% of ++ cases of which 51% were alive after four years, 35% (that is about 8% of the total) were at work. Of 46% of +- cases of which 72% were alive after four years, 50% (that is about 16% of the total) were at work.

Of 84% of survivors of the	first stage	49.5%	were fit for work.
" 79% " "	second	" 45.0%	" "
" 4% " "	third	" 36.0%	" "

According to the statistics of the L.C.C. (1928) there were out of 75% of the survivors in the first stage, after five years, 74.2% at work ; of 35% of survivors in the second stage, 54.3% and of 5% who had survived in the third stage, 34.8% who were at work in 1933.

According to the statistics of the Swiss Confederation (38) based on Annual Reports and observations of a number of Swiss Sanatoria the working capacity one to 15 years after discharge showed that these able to work after 15 years numbered 46.24%, the invalids only 5.44%; those who had died 36.05%. In these statistics only those capable of full work are here reckoned as fit for work, the partially fit for work who could not entirely provide for themselves were counted as invalids. Of 8,756 ex-patients 86% could be traced.

The number of those fully able to work is on the average

1 year after discharge	..	..	..	..	..	58.1%
2 years	"	"	..	..	..	61.3%
3	"	"	"	..	..	55.0%
4	"	"	"	..	..	53.0%
5	"	"	"	..	..	52.3%
6	"	"	"	..	..	44.8%
15	"	"	"	..	..	46.2%

These relatively high numbers of those fully capable of work, are further to be explained by the fact that the open and closed cases have been counted together.

Of those in the first stages of the disease there were after one year 88%, after ten years, 80% fit for work.

Of those in the second stage, after one year 65%, after ten years only 40% at work.

Of those in the third stage, after one year 30%, after ten years 8% were fit for work.

We have a detailed study, by Whitney and Myers, published in 1930, in which are examined the reports of two State sanatoria in the U.S.A. covering a period of 20 years (Fig. 17). In these statistics no division is made between open and closed cases or between ++ cases and +- cases.

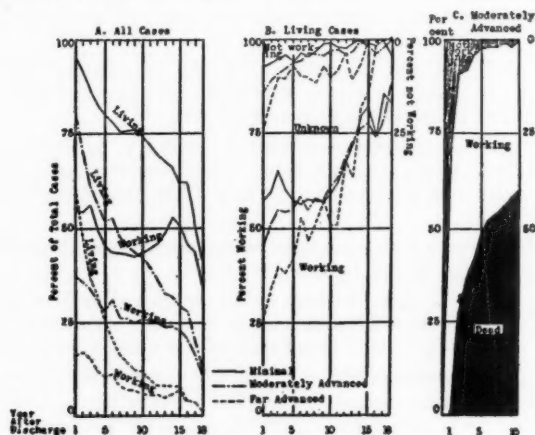


FIG. 17. WORKING CAPACITY OF TUBERCULOSIS CASES

Reproduced from Whitney and Myers' Post Sanatorium Histories. *Amer. Review of Tuberculosis*, Vol. 21, 1930.

Fig. 17

Dead after Years.	Minimal (Stage I.)	Moderate (Stage II.)	Far Advanced (Stage III.)
5	22%	48%	75%
10	25%	60%	90%
15	38%	70%	90%

Percentage of survivors known to be working fifteen years after discharge :

Of the minimal cases	..	..	..	82%
Of the moderate cases	..	..	..	78%
Of the far advanced cases	..	..	..	0%

Whitney and Myers (39) confirm the fact which was already made apparent from the Swiss statistics that the group of tuberculous in full work alters little after a few years.

The invalids, some of whom in the first years are found at work, gradually die out, but after 15 years, almost all those who have survived are at work. This statement is not conclusive, since the number of those whose position with regard to work cannot be given is comparatively large. An attempt is made to compensate for this defect by following up carefully over a period of ten years a small group of *moderately advanced cases* who were still alive one year after their discharge.

Of these 156 known cases, from 80 to 90% worked during the first five years. After ten years during which about 60% died, the 40% of survivors were almost all at work. (Fig. 17c.)

Whitney and Myers formed the conclusion that "It is clear then, that tuberculous patients who survive from year to year are largely able to carry on more or less normal activities."

The statistics of Whitney and Myers prove only that a tuberculous patient discharged from a sanatorium finds himself compelled to seek and obtain some employment no matter what it is; and without regard to his physical condition. Even the majority of those dying in the first five years tried to find work somewhere.

Bates is concerned with the question of expectation of life and economic activity among the medical students and doctors who had been treated in the Trudeau Sanatorium. Out of the group who felt themselves strong enough to return to work immediately after the course of treatment, 82.8% was still at work at the end of the first and at the end of the second year 63.9%. Of the second group who did not feel themselves able to resume work 39% relapsed, some had died by the end of the second year while others were again receiving treatment in a sanatorium.

It goes without saying that those who feel themselves, from the beginning, strong enough to return to full work are identical with the group who have the best expectation of life; and those who, from the beginning, must be careful, belong to the group of doubtful cases.

From the Münchbach figures, it appears that after two years the stable ++ and +- cases were all at work and nearly all of them remained at work during the whole period of nine years. Those who after two years were described as unfit for work were all dead after six years, and those who were capable of partial work, had died after nine years.

Münchbach, without going into more detail, draws attention to this peculiar constancy in the working capacity of those in the first stage of open pulmonary tuberculosis.

The Bilthoven statistics show with regard to the year-groups 1921-25 similar proportions. Here also after two years the prognosis as to the working capacity has become clear.

After two years, about a third of the ++ cases possessed full earning capacity, and two-thirds, partial earning capacity. Those unfit for work had all died after nine years, but the 7 to 8% who were capable of partial work were after nine years still alive (about a third, capable of partial work, two-thirds unfit for work). The group of stable cases fully able to work, scarcely altered after the second year. The proportions for the year-groups 1930-32 are similar as far as a period of four years allows comparison.

After two years, of course, there is still a fairly marked difference.

Year-groups 1921-25.

% ++ Cases.	After Years.	Survivors.	Fit.	Partially Fit.	Unfit.
66% {	2	58%	29%	20%	49%
	4	44%	49%	16%	35%
	9	30%	60%	19%	21%

Year-groups 1930-32.

% ++ Cases.	After Years.	Survivors.	Fit.	Partially Fit.	Unfit.
34% {	2	55%	45%	39%	16%
	4	40%	60%	10%	30%

Although, owing to improved methods of treatment, all those cases in the group 1930-32 which were not entirely intractable to treatment were eliminated from the ++ group, the working capacity of this group is better than that of the group 1921-25.

Also with regard to the +- class in the group of 1921-25 and in that of 1930-32 more than half were capable of full work after two years and this working capacity was with few exceptions maintained during the whole period.

In the +- class of the period 1930-32 an indication of improvement in results can be seen in the fact that some of those fit for partial work later become fit for full work.

The class of tuberculous, capable of full work, becomes larger on account of the increasing intensity of treatment.

Year group 1921-25.

% +- Cases.	After Years.	Survivors.	Fit.	Partially Fit.	Unfit.
34% {	2	83%	85%	5%	10%
	4	80%	63%	20%	17%
	9	70%	72%	12%	16%

Year-group 1930-32.

% + — Cases.	After Years.	Survivors.	Fit.	Partially Fit.	Unfit.
66%	{	97%	60%	24%	16%
	4	90%	70%	19%	11%

Summary.

A glance at the graphs on page 47 and the statistical data leaves no doubt that the fate of tuberculous persons is dependent on whether stabilisation is possible and obtained or not. The tuberculous person who in a period of observation is proved to be a good chronic or recovered case is thereafter relatively independent of environment. On the other hand the length of life of the non-stabilised case is largely determined by environment. That is true in still larger measure of the "intermediate group" (Lawrason Brown), i.e., those on the borderline between the good and bad chronic cases. The same is true, *ceteris paribus*, of the non-stabilised + — group (conditionally arrested).

If the earning capacity of these borderline groups is to be used, account must be taken of the fact that these groups are extremely variable and sensitive to their environment—thus in great need of after-care.

It would be an error to assume from the statistics that all the tuberculous persons who are at work are really able to work. On the contrary, the history of a large number of these cases is a continual series of breakdowns. For present-day economic conditions cause the vicious circle that the tuberculous must work in order to live while the pressure of work endangers his life. On the other hand these statistics confirm the experience of doctors gained especially in the industrial settlements that the tuberculous person, in so far as his survival can be assured even though he remains an open case, possesses earning capacity which can be used in an economic sense. The tuberculous has the same right as any other disabled person to economic rehabilitation. In the course of years and decades, his power to produce creates far more wealth than is spent on his treatment and rehabilitation, but the utilisation of his earning capacity brings profit to the patient and to the community only when it is carried on under precautions which at the same time constantly renew the earning power.

CHAPTER 2.

Working and Earning Capacity and Industrial Research.

For the rehabilitation of the tuberculous the estimation of working and earning capacity is of fundamental importance. Rehabilitation is in reality a technical question which must rely on medical opinion.

The old method of judging the working and earning capacity consisted in an estimate made on the basis of the clinical diagnosis. Von Weizsaecker (40), who has criticised this deductive method in a number of works, rightly asks the question, "what intellectual process leads the doctor from the contemplation of an X-ray film to the statement 'there is a reduction of wage-earning capacity of 0, 20, 40 or 80 per cent.' None. A vague judgment based on impressions, an almost unconscious estimation of the moral will of the sick person, a habit of estimating which develops unconsciously, all play their part. And indeed we must make such estimates daily. Imagine the face of the purchaser of a motor car the horse power of which would be declared according to such methods." With these words Weizsaecker aptly describes the situation created by social legislation. So long as health insurance only asks the question to what extent is a reduction of earning capacity to be compensated by a pension, a well organised system of estimation and a good understanding between the doctor who makes the estimate and the civil magistrate who assigns the grant will remain sufficient to avoid injustice.

But as soon as an official concerned with rehabilitation or an interested employer (like the purchaser of the motor car) who is to use the earning power asks similar questions, the estimate is no longer adequate.

The transition period from an adjustment by insurance methods to a social-economic one; from compensation for a physical handicap to utilisation of the earning-capacity which remains, demands new concepts and new methods, which are adequately supplied neither by the concepts of academic medicine nor by those of existing social legislation. In social insurance legislation a dualism is present and independent verdicts are demanded from doctor and civil magistrate. The doctor may only give a certificate as to how far the person insured is prevented from using his powers freely: the civil magistrate (Verwaltungsjurist) decides according to law whether and how far, the person insured can still use the physical and mental powers left to him, for the purpose of earning a living. "For this decision is more than a purely medical judgment. To make it, training in legal matters and in economics is required and the answer to these questions is entrusted to the insurance authorities." (Unger 41.)

"Thus, the verdicts on unfitness for work, and its associated problems, incapacity to earn a living, vocational incapacity, etc., are pronounced separately from the medical and from the economic standpoints." (Hollmann 42.)

Practical rehabilitation demands that this dualism be overcome and insists that estimates made on purely deductive lines be replaced by those worked out on empirical and experimental lines.

The estimate of "wage earning capacity" (Varrier-Jones) as a basis for the assessment of the possible utilisation of the working capacity of the substandard worker, requires physiological and economic control.

The methods used for this empirical evaluation of working and earning capacity are based on principles which have already been evolved in industrial research.

Working capacity tests.

The first question is that dealing with the prognosis of working capacity, working and earning capacity being a function of stability. This question can only be answered by figures indicating the probability of survivals.

The second question is concerned with the "response of the tubercular organism to work" (Varrier-Jones). It is answered by means of a clinical-biological checking of the reactions during measurable work.

The third question is concerned with the extent to which the reserves of all the functions required are drawn upon when working. It is answered by means of an efficiency test such as is used in industrial physiology.

The fourth question, that of aptitude, is determined by industrial psychology.

The last question deals with the calculation of the economic value of the previously tested working capacity. This is answered by an examination of the efficiency of substandard labour in test factories.

It is clear that this whole series of investigations is not necessary in every case. We have seen from the consideration of statistics that only by an exact prognosis is it possible to determine the wholly incapacitated with complete accuracy and the stabilised cases with almost complete accuracy.

But with the large class of intermediate cases after-care is needed. During this period all efforts should be made to enable a final judgment, regarding working and earning capacity to be made with something approaching certainty.

Prognosis of working capacity.

The clinician sees in an over-estimation of figures a diminution of his intuitive skill. But just as in social medicine, the technical routine has successfully supplemented the old clinical methods, so the medical statistics on life expectancy will be the basis for social medical prognosis. Diagnosis and prognosis will continue to depend on intuition. The greater number of objective symptoms we can take as bases, the smaller the number of possibilities becomes, the more certain the verdict and the more authoritative the social medical judgment.

Thus, the ideal would be a system of "life tables" where the expectation of life of any patient could be at once seen from his symptoms. This method borrowed from the practice of life insurance which Pearson was the first to apply to tuberculosis has born fruit in the recent statistics of Wingfield. (Fig. 18)

These statistics are, however, based only on a rough classification into the three stages. But these classifications are much too indefinite and must therefore give place to a characterisation of the condition through a series of symptoms.

In this connection it is not the symptom in itself which is of importance (e.g., sputum records, sedimentation rate, temperature, pulse, etc.), but the changes in the records of these characteristics during a period of treatment.

There already exist to-day a number of publications in which such a scheme is set forth. Trudeau correlated x-ray findings and prognosis.

Braeuning connected the probability of survival with the changes in the sputum records from + to -, the number, size and quality of the cavities and

X-RAY DIAGNOSIS.

GRAPH COMPARING THE PROBABILITIES OF SURVIVAL ACCORDING TO THE CONDITION OF THE LUNGS AS SHOWN BY AN X-RAY EXAMINATION MADE UPON ADMISSION TO THE SANATORIUM.

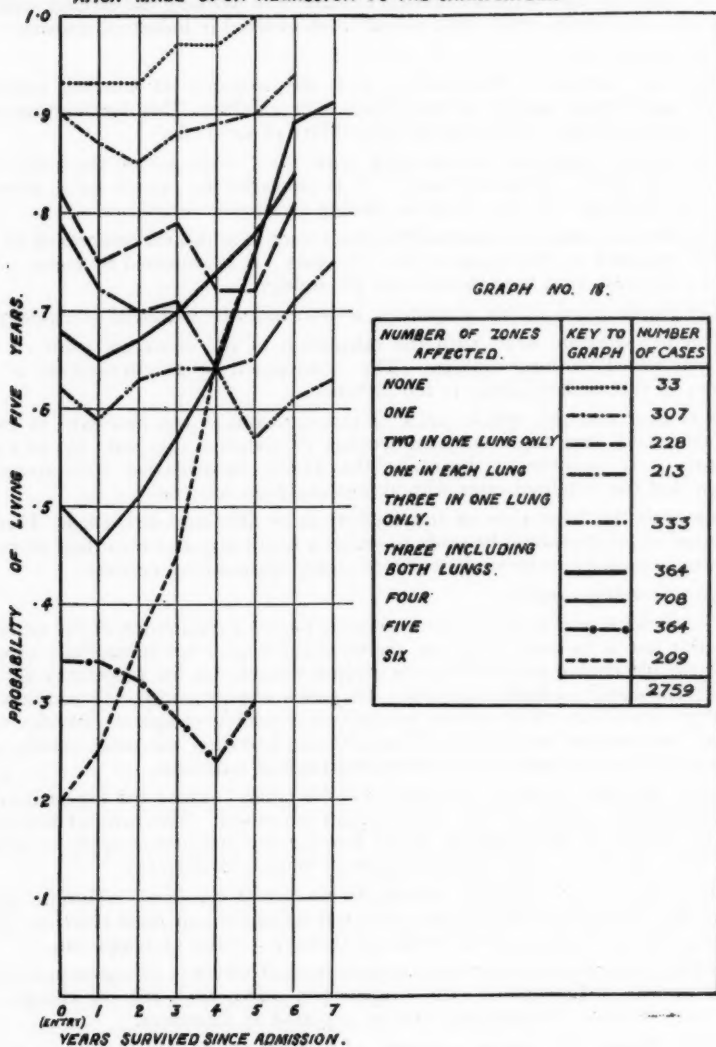


Fig. 18.

Reproduced from the Brompton Hospital Report.

the sedimentation rate; Trail, the changes of the sputum records and the sedimentation rate; Graeff proposed a prognostic index which would give the prognosis of a case from the changes in the nature of the cavities, from the duration of the disease and from the therapy applied.

Through the narrowing down of the possibilities and the combination of the largest possible number of symptoms whose influence on the prognosis has been worked out statistically, an ever growing measure of certainty in prognosis can be attained.

A short formula at the top of the patient's file makes the case considerably easier to understand.

Cavity.	Sputum.	Sedimentation.	Temperature.	Pulse.	Weight.	Zone.
a b	a b	a b	a b	a b	a b	a b

(a) means the record at the beginning; (b) at the end of treatment or at the beginning and end of a certain period of observation. It will be easy to come to an agreement as to which symptoms shall be given and whether the values or size of cavities, weight, etc., shall be given, or whether a scheme shall be used which gives the gravity of the symptoms according to a fixed key.

Response to work.

It is rather a fiction than a fact that exercise or work in the sense of occupational therapy can be successfully used as an efficiency test. Observation has shown that work sometimes can have the same effect as a lesion and cause reactions in the organism of the tuberculous. In accordance with the principles of experimental medicine, "work" was given in small doses as a stimulant and the biological reactions were observed before these lesions occurred. The investigations of M. Paterson on the "Autotuberculinisation" through work, the careful investigations on the rise of temperature following exercise, will always be of theoretical importance. But none of these methods has acquired practical importance.

Repeated attempts have been made to discover new reactions, more sensitive to the stimulant "work" (e.g., sedimentation rate, metabolism, blood-pressure). None of these reactions are typically influenced by occupational therapy or exercise. On the other hand, the reaction of the patient as a whole, the change in his condition under the influence of the transition from rest to exercise and from exercise to work is still considered of clinical importance.

"Occupational therapy" has been described in the third Report of the Joint Tuberculosis Council (43) as "a valuable asset to the physician in determining the physical capacity of the patient for exercise and subsequent employment."

According to a memorandum (Nat. Tb. Assoc., U.S.A.) based on a questionnaire sent to 540 sanatoria of the country, a lower value is attributed to occupational therapy as an efficiency test.

Work therapy becomes a test only when it is carried out in the form of regular employment, that is as a routine work of vocational character. When occupational therapy takes the form of sheltered employment, the doctor responsible for this form of treatment, must make records of the reactions at regular intervals. Sheltered employment is in itself a permanent and methodical "*epreuve lesionelle*." It is a rule that the careful clinical examinations which are a part of the routine of the sanatorium treatment should be continued regularly during sheltered employment. Here, too, it is advisable to concentrate on a few measurable tests, regular X-ray examinations (monthly screening, quarterly X-ray picture), regular sputum records, and monthly records of weight, sedimentation rate and white and red cell account.

As a rule it is not only the reaction to work, that is observed, but also the course of the disease. These records sometimes give alarm signs, indicating that work must be stopped.

In any case, these records are the necessary bases on which the supervising doctor must judge the doses of work with due regard to its nature, speed and duration.

Efficiency test.

Under normal conditions, work like any physical exertion, draws only to a limited extent upon the functional reserves of the body. In the case of brief unusual exertions and excessive strain, which can be borne without injury only for a short time, the limits of functional capacity are reached and the reserves exhausted. If again the reserves are used up by pathological processes and the functional capacity diminished, then even under normal strain the organism works near the limits of its functional capacity. As in the case of an engine which is run at top-speed, the result is that the organism is prematurely worn out. Therefore it is of medical interest to establish by means of an efficiency test the limits of functional capacity of the functions used in all the cases in which the doctor has to decide as to working capacity. If the process of work and the machine must be so arranged as to take into account the laws of the human body, we must really know these laws, both physical and mental. One of the first questions which is put to us, is the question as to the amount of work which an individual can be expected to carry out without injury (Lehmann 44). The working capacity of the healthy worker is dependent on factors, "which can be defined physiologically or even psychologically."

The introduction of a substandard worker into an industry presupposes that these factors have been tested.

As one has to reckon with patho-physiological disorders, it is not only applied physiology, but patho-physiology, since it is precisely in those functions which are used during the process of work—respiration, circulation, metabolism—that pathological conditions may prevail in the tuberculous organism.

Whereas physiological research has standardised the so-called efficiency tests (cf. efficiency tests which are applied in professions where physical and mental strain is great), the patho-physiology of tuberculosis as well as of other chronic diseases is still in the stage of experimental research. (Brieger, Rüttgers, Knipping, Anthony, Moncrieff.)

Since A. V. Hill, by analysing the effect of muscular work on the biological system laid the foundation of industrial research the *ergometric test* has become the prototype of the efficiency test. This test serves in the first place to determine the utilisation of physical energy in the performance of work. A machine works economically when the energy is converted as completely as possible into work. In the working of every machine some energy is wasted. But the less energy is lost the more economically the machine works. The same rules apply to the human organism.

The efficiency of a machine whether human or mechanical, is expressed in the percentage of energy released which is converted into work. The optimal net efficiency in body work is between 20% and 30%. Variations in both directions are caused by constitution, age, exercise, working conditions, speed and types of work. There are very few problems in applied physiology which have been studied under so many and such varied conditions.

The net efficiency varies according to whether one is walking, running, turning a wheel or cycling. It can be considerably increased by training: in the case of the

trained cyclist, from 20% to 25%, in the case of the trained professional cyclist to 30%. This holds good in the case of the trained and untrained skier. In the case of abnormal work—for instance in the case of a horse forced to go backwards—the net efficiency may diminish by more than 50%. (Zuntz.)

Every working process has its optimal conditions, which give the highest net efficiency; e.g., the net efficiency may drop from 20% to 7%, if the crank to be turned is not at the most suitable height.

The working speed can affect the net efficiency considerably. When in pedalling a bicycle the rotations per minute of the gear-wheel were increased from 71 to 100, the net efficiency decreased from 24.5 to 15.6%.

In the different types of handicrafts, the net efficiency is nowadays known.

Work.	Net Efficiency %
Filing	9.4
Cranking	20.0
Lifting weights	8.4
Vertical lever (pushing)	14.0
Cycling	30.0
Thrusting with dumb-bells	10.0
Walking	33.5

Infections of every description, a simple infection as well as more serious ones like bronchitis can lead to a decrease in the net efficiency. (Vos.) In the case of heart disease the work done shows, as a rule, a low standard of efficiency. In the case of tuberculosis, the conclusions are not quite clear. A number of the tuberculous may work with absolutely normal net efficiency, others again have a considerably lower net efficiency. (Brieger, Rüttgers.) Tubercular persons, who when not overstrained work with normal efficiency, very frequently show a decrease in net efficiency when the amount of work is increased. Healthy people, on the other hand, are, as a rule, more likely to increase their efficiency when the amount of work is increased, or to increase the energy expended in proportion to the work performed. (Zuntz, Benedict, Haldane, Douglas and Priestley, Atzler.)

In many cases even the tuberculous follow this rule. It has not been possible to prove any close connection between a decrease of the net efficiency and an increase of metabolism, sedimentation rate and the general activity of the disease. If a tuberculous subject is found to work with normal net efficiency when the amount of work is increased, this fact (in connection with other data) can be considered an important sign of stabilisation. For this reason the introduction of the ergometric test is to be recommended.

The method of the ergometric test consists in determining the consumption of oxygen as a measure of the expenditure of energy, in the course of measurable work. (Ergometer.) According to A. V. Hill's directions, the consumption of oxygen not only during the working period, but also during the "period of recovery" must be determined and taken into account as energy expenditure, the energy used by the resting body being of course subtracted. The lower the capacity of the circulation to absorb oxygen, the larger the oxygen debts, i.e., the greater the amount of oxygen used in the recovery period in relation to the total amount used, and the longer the period of recovery.

In determining the period of recovery and the amount of oxygen used in it, very considerable differences are found in the case of the tuberculous compared with the healthy worker. The period of recovery may be doubled or trebled and while

respiration and pulse rate may have returned to normal, the amount of oxygen used in the recovery period during the usual times of observation may still lie far above normal.

The determination of the recovery period and the amount of oxygen used in it is therefore a very essential test, which ought to be carried out even when an ergometer is not available or when for any reason (e.g. in order to spare the patient) the amount of oxygen used during work is not determined.

A normal period of recovery when net efficiency is good, is a further proof of considerable functional capacity, and, where tuberculosis is concerned, is found almost exclusively among stabilised cases.

When the functions of circulation or respiration are inadequate, a larger amount of breathing air is required to take 100 ccm. of oxygen from the air inhaled than when the functional capacity of circulation and respiration are normal. The utilisation of oxygen from the air under resting conditions is seldom changed in the case of tuberculosis. When working with an ergometer the utilisation may diminish. It may therefore be useful to determine either the "Atemæquivalent" (Anthony) or the "Ventilation Coefficient" (Simonson) under resting and working conditions.

By "Atemæquivalent" is meant the amount of air (liter) from which the lung takes 100 ccm. of oxygen, by "Ventilation Coefficient" the amount of oxygen that is taken out of 100 ccm of air.

The ergometric test is also a test of the co-ordination of respiration and circulation. An easy method of analysing the function of respiration is the use of spiographic registration. But these respiratory tests in themselves ought not to be over-estimated. They may, in an artificial pneumothorax case, for example, show very unfavourable results and yet the working capacity be perfectly normal.

An increase in the respiration rate during the work-test is only of slight significance, since in general the frequency is adjusted to the speed at which the body moves.

The ventilation rate is registered when metabolism is determined. The return of the ventilation rate to normal during the recovery period is in the case of tuberculosis not always parallel to the return to normal of the consumption of oxygen.

Of the numerous functional tests other than the energometric used to determine the respiratory reserves, we will only mention here the vital capacity test, which is important in connection with the whole series of functional ones.

A very practicable test is the determination of the "breath holding time." With a certain amount of practice it is possible to obtain very reliable results. The breath holding time is always cut short in the case of tuberculosis and the more this is so, the less the co-ordination of the circulatory and respiratory functions. (The breath holding test has been standardised in the Royal Air Force tests.)

Efficiency tests based on the analysis of the gases of the alveolar air—for instance, the part played by the "dead space" (Moncrieff) are so full of sources of errors that in the case of tuberculosis, they are easily misleading. Therefore, Haldane and Douglas' method of determining the circulation rate can be used only if oxygen tension of arterial blood is measured by obtaining blood direct from an artery. Grollmann's Acetylen method is impracticable because the smell produced is extremely unpleasant for the patient.

In routine examinations it is wiser to confine the tests to the checking of the pulse and to examine most carefully the changes in pulse rate and oxygen consumption

in their relation to each other, during rest and work. An over-increase in the pulse rate during an ergometric test indicates either a functional deficiency due to a decrease of the heart output or an over-increase in the circulation rate. If the relation of pulse rate and oxygen consumption changes during the ergometric test, this must be considered as a symptom of lack of co-ordination.

Eppinger has studied in the case of heart disease during exercise the relation between pulse rate and oxygen consumption and plotted the results in a diagram which shows the increase in the pulse rate for the trained and untrained healthy person. By using this table and introducing the results obtained from tuberculous persons, it is easy to show the variations from the normal.

The return of the pulse to its normal resting rate in the recovery period after exercise is a sign of the functional condition of the circulation, and has always been used as a routine test.

These remarks are not intended to give a complete description of the method, which will be published elsewhere.

The efficiency tests are laboratory methods which examine the separate functions and the co-ordination of the functions under measurable conditions. But these conditions are artificially produced and never correspond to the conditions of real industrial life. In the ergometric test, for instance, the tuberculous is burdened for the short period of five minutes with an amount of physical labour which probably occurs in no type of handicraft or industry. The only comparable strain may occur in the climbing of stairs and in heavy physical labour.

If, instead of ergometer work, some form of natural exercise is chosen, as, for instance, walking, or industrial work, differences from normal reactions are rarely registered. After half-an-hour's walk or even after four hours' industrial work, the consumption of oxygen returns very quickly to that obtained in the state of rest almost as quickly as in the case of normal persons, although the tuberculous may be more tired (Brieger). Fatigue can never be measured by purely physiological methods.

Under the conditions prevailing in normal industrial work, the functional reserves may be used up, but never so far as to cause disturbances of co-ordination. The dyspnoea occurring during exertion is usually felt by tuberculous persons only under exceptional strain. But it may exist though unobserved and it is the function of the efficiency test to discover this latent dyspnoea and to give directions so that the human machine shall be used both economically and sparingly in relation to its functional reserves. It is then easy even for individual cases to suit the work to the worker (Varrier-Jones).

During the work cure, post-cure, or permanent sheltered employment, these ergometric results must be checked at regular intervals as a supplement to the clinical biological records. In all the cases which react favourably to work a general adaptation to work similar to that in general training will result in an improvement in the values of the ergometric tests. On the other hand, the contrary is to be expected when adaptation to work is unsatisfactory. Investigations can only be carried out in industrial settlements and are only now in process of being worked out.

Ability Test.

The physiological efficiency test is a method of determining the working capacity and capability of a tuberculous patient or ex-patient in an industrial workshop. This capability does not merely depend upon the physiological status. In the memorandum of the Tb. Association, U.S.A., attention is drawn to a problem

the importance of which has been sometimes under-estimated : the psycho-technical suitability of an ex-patient for vocational labour.

The National Tb. Association in the U.S.A., has investigated by means of an enquiry in a large number of sanatoria, the education and training of the tuberculous patients. "The vocational maladjustment" was twice as large in a group of 100 tuberculous as in a comparable group of 7,000 healthy people.

In the course of two years 4,069 patients in different sanatoria were interviewed ; these representing 51% of those under 63 years of age, 63% of those under 36 years of age—60% of this total had only an elementary school education without any vocational training.

Half of these patients were occupied in "domestic and industrial professions." The number of domestic servants was four times as great as the numbers in any other occupation.

38.6% wished to return to their old occupation, 27% desired a change of occupation.

Scanty training limits a patient's capability still further. "It means that these patients with an eighth grade education or less have two handicaps, an educational and a physical handicap. Educationally they are in general unfit to enter jobs suitable to their physical handicap, and physically they are usually unfit for the only kind of work for which their meagre education fits them." (Burhoe 45).

These investigations inaugurated an educational campaign on a large scale which by employing all the means of modern pedagogy do justice to "the vital need for adult education and vocational guidance."

For this purpose, an office has been set up in New York at the headquarters of the Nat. Tb. Ass., and similar offices have been established in Minnesota and other States to deal with the tests of vocational capability, training and in short all possible capability.

A large number of sanatoria have already joined this organisation and submit their patients to psycho-technical tests which are carried out on the principles of the Minnesota Employment Stabilisation Research Institute under the supervision of the American Association of Adult Education.

The aim of these ability tests is "a social diagnosis based on a comprehensive study of work, experience, education, tastes and aptitude" (Emerson 46).

CHAPTER 3.

The Economic Value (Realwert) of the Tuberculous Substandard Worker.

These clinical, physiological and psychological tests give an objective definition of the physical and mental state of the tuberculous substandard worker. A person whose physical or mental capacity is below the normal is necessarily a substandard worker. The problem is to discover what may be called the economic equivalent of physical deficiency, i.e., the relationship existing between a physical substandard and an economic substandard. Here, however, it must be remembered that a lower standard in one sphere may be compensated by a higher standard in another. Thus a lower physical standard may be compensated by technical or mental superiority.

Experts or fully skilled workers who are temperamentally suited to their work will very often have a higher standard of efficiency than the average worker, even when they have a physical defect. On the other hand, in the case of adults, meagre education, inadequate training, lack of will to work, etc., may decrease yet further the efficiency of an already low physical standard.

If a physically substandard person is to be incorporated into industry, his deficiency must be known in all its details to the rehabilitation authority. The records of the efficiency tests must therefore include a detailed analysis in which each function is considered. But the result must be summed up in a conclusion which is understandable even to the non-medical man. Here, too, it must be remembered, that we are working so to speak on the borderland between medicine and economics, that our medical language is not generally comprehensible and that an industrial manager prefers figures and symbols to descriptions.

For this reason it has seemed advisable to work out the efficiency standard from a system of marks, adding up the points for the separate factors. A similar system has been used with success in the efficiency tests for occupations which require a particularly high physical or mental standard (Efficiency tests for airmen).

When speaking of a substandard worker we take into account the fact that functional inferiority is expressed by a decrease of the economic value of the worker. The patho-physiological problem becomes of necessity a problem of industrial physiology. The patho-physiological problem is: which organs and functions have defects and diminution? The problem of industrial physiology on the other hand is: what can a man accomplish with the functions left to him? "Pathology determines the nature of the disease, but not the form of the health remaining and not the way in which the remaining functions can be used." (Weizsaecker 47). No deduction from clinical data or from laboratory tests can lead to a conclusion as to the economic value of the remaining efficiency of the tuberculous. The only way to do this is to measure the economic output of a substandard worker and to adjust the conditions of work so as to make his output as normal as possible. Thus the problem is turned into one of industrial physiology described as a science auxiliary to the organisation of industry. "Industrial physiology constitutes at the present

day one of the most important fundamental facts if not the essential fundamental fact of the scientific organisation of industry. Physiology and technique must be studied with a view to ensuring that human energy is used to the best advantage in the service of society and with the least possible harm to the individual, who would thus furnish the maximum of production with a minimum of fatigue." (48).

The immediate goal of industrial physiology is the increase of production but at the same time it also aims at securing the greatest possible saving not only of the inanimate, but also of the living factors in production. Only by industrial physiology is it possible to understand the reciprocal effect of the utilisation of technical improvements and of human working capacity—the essence of rationalised industry.

It is the aim of industrial physiology to increase the economic value (Realwert) in the case of the normal worker, and to compensate an economic deficiency (Realinsuffizienz) in the case of the substandard worker.

There exists a fundamental relation: the greater the industrial and physiological rationalisation and the higher the standard of efficiency of the worker, the higher the economic output of any given industry.

When the physical standard is normal, the economic value can be increased by rationalisation. On the other hand, when the standard is subnormal, the average economic value can be obtained by super-rationalisation or by suitable placing of substandard workers in rationalised industries.

The problem of the utilisation of substandard labour, which is not due to physical disability (i.e. woman and child labour) has been thoroughly studied by institutes of industrial physiology throughout the world. The International Labour Office has busied itself with these problems again and again. The same methods and principles must now be applied to the problem of pathological substandard labour.

The estimation of the earning capacity of a substandard tuberculous worker therefore, cannot be deduced by means of analogies. If the earning capacity is to be rightly utilised, the possible utilisation must be worked out directly by evaluating the relation between physical strain, rationalisation, and industrial output in each individual case and for each separate industry.

But this estimation presupposes the existence of industries which employ substandard workers. This problem is very reminiscent of the old riddle of the chicken and the egg. For no industry can be built up with substandard workers without their working capacity being known. This capacity cannot be discussed until substandard work is used in industries. Therefore industries must be created with the special character of "sheltered industries": they must be economic industries, they must employ substandard or otherwise unemployable workers, they must be under medical supervision and place the worker in the job in which he can attain the maximum of efficiency with a minimum of effort.

These industries have been described as "test factories" since they have to find out the conditions, under which normal earning capacity can be attained and whether these conditions exist or can be realised in normal industry or whether they must be created in the form of sheltered employment in a special industry.

It was formerly believed that occupational therapy could fulfil the functions of the test factory, but none of the activities in occupational therapy leads to wage earning. Neither working hours, nor speed, nor efficiency—neither amount of work nor working and living conditions—correspond to the conditions under which work is done in normal life.

The experience of sheltered industries provides the material which must be collected and worked out by an industrial research centre in order to define the earning capacity of the tuberculous both in general and for the individual case.

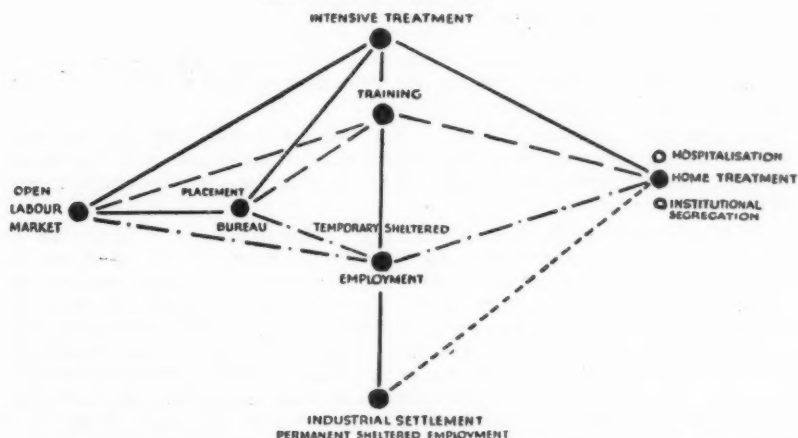
CHAPTER 4.

Social Readjustment.

Industrial Convalescence.

Viewed from the standpoint of industrial physiology, the two fundamental problems of social readjustment and rehabilitation appear in a new light. We distinguish two phases in the process of rehabilitation: (1) industrial convalescence, whose aim is the maximum stabilisation of efficiency, (2) industrial re-employment, i.e., the creation of sheltered conditions in which working capacity can be used either in normal industrial life or in sheltered industries as a means of economic existence.

A Rehabilitation Scheme.



Industrial convalescence or temporary sheltered employment is a part of sanatorium treatment, in so far as the latter does not lead to complete physical rehabilitation. Sanatorium treatment ends with a certain phase of training; if the medical result proves unsatisfactory temporary sheltered employment must follow, in which the building up of an economic existence is connected with physical rehabilitation. From the standpoint of organisation, sociological and economic problems predominate during this second phase of the programme of rehabilitation. These problems are: the formation of a community of ex-patients, who are to live together for a comparatively long period, and the establishment of an industrial undertaking which makes it possible to maintain such a community.

The goal of this temporary sheltered employment is, then, the re-incorporation of the ex-patient as a full-time worker into normal industrial life. But this period of sheltered employment may last weeks, months, or years, according to the condition of the case. "Probably the outstanding conclusion made from the studies which

have been undertaken with regard to suitable employment for arrested cases of tuberculosis is the prolonged period of what may be termed industrial convalescence necessary in the great majority of cases . . . the problem, therefore, which presents itself is the provision of opportunities for what has been termed sheltered employment for such cases." (Kidner 49.)

This temporary sheltered employment may be organised in various ways.

(a) In all cases whose domestic and industrial circumstances permit them to be treated with special care and consideration, this may be done without special institutions within the family.

(b) By means of part-time work and financial compensation for the reduced wages.

(c) By means of temporary sheltered employment on the staff of the sanatorium in which the treatment has taken place.

(d) By attaching Industrial After-care Colonies to sanatoria.

(e) By means of Urban Workshops.

(f) By means of the industries established in a Sanatorial Industrial Settlement.

(g) By the establishment of Post-sanatoria.

(a) In many instances, intelligent patients, who are not under the necessity of earning their full livelihood are able under medical supervision to create the conditions of industrial convalescence at home.

(b) For those workers who have been assigned to industrial life, and who cannot avail themselves of the arrangements for institutional and semi-institutional after-care, even when these exist, half-time work is the most suitable form of temporary sheltered employment.

In France (before the economic crisis) the "Ligue pour la Réadaptation du physique diminué" endeavoured to employ ex-patients of sanatoria as "mi-temps" workers in industry. The wage-deficiency was made good by the "Assurance Sociale." But this system was not entirely satisfactory either to industry or to the doctors. Employers and after-care authorities continually complained to the Bureau of the Ligue that these workers either did not take their work seriously, or else did not use their leisure in a manner calculated to promote convalescence. For this reason, it is now intended to create special after-care workshops for these non-stabilised cases, and at the same time to place the adults in hostels.

In Germany, doctors have repeatedly urged that the consolidation of treatment should be ensured by part-time work. The Reichsversicherungsamt (50) has therefore introduced measures, which are to "provide temporary financial assistance, to be diminished as health is regained, for the tuberculous patient, who, at the completion of sanatorium treatment, is still in need of special consideration: he will thus be enabled to resume his vocation step by step until at last he is doing full time work."

(c) The National Tuberculosis Association of U.S.A., in a memorandum which we have already mentioned, puts forward once again an often discussed proposal, that of giving the tuberculous patient, before his discharge, a job on the sanatorium staff (Burhoe). Here the question of living quarters, of the formation of camps for these resident workers, is at once raised.

(d) The ideal solution for temporary sheltered employment is the creation of after-care workshops and colonies in connection with existing sanatoria.

The utilisation of working capacity in these after-care colonies is not a hobby, but is an essential duty not only for the patients, but also in order to justify the experiment from the economic standpoint. To give a purpose even to sanatorium life is a problem; it is a much harder problem still in the case of a post-cure, which stretches usually over a fairly prolonged period. The patient who decides to undergo this post-cure, and the authorities who have to bear the expenses, both demand that time and money shall be usefully employed.

An independently organised industry must therefore be available; it must have a certain turnover, which demands the full working capacity of the patients and rewards them according to the work they accomplish. Every day turned to economic account in this way after the completion of treatment, is an economic gain.

(c, f, g) Urban Workshops and Post-sanatoria are institutions which were established with no other aim than that of industrial convalescence.

Sanatorial Village Settlements are from their designation, certainly not destined for temporary after-care; but since convalescence must form a part of any settlement scheme, every ex-patient of the sanatorium department must pass through the scheme as a potential settler.

Re-employment.

Not all those discharged from sanatoria need the intermediate period of industrial convalescence. From the first, the two extreme groups, the sufficiently arrested cases, and the complete invalids are eliminated. During industrial convalescence the group of sub-standard workers narrows down still further as stabilised cases are discharged to their homes and invalids relapse and require further medical treatment. At the end of this period there remains a middle group of sub-standard workers, for whom it must now be decided: (a) whether they can be rehabilitated in normal industrial life (assuming that part-time employment can be found for them); (b) whether they are unemployable in industrial life and need institutional segregation in the form of a sheltered environment; (c) whether they are unemployable in normal industrial life but can be employed as sub-standard workers in sheltered industry.

Placement of arrested cases.

Rehabilitation in normal industrial life is the primary object of the rehabilitation service. Only in a few countries has legal provision been made for the organisation of a service of rehabilitation for the disabled. "Rehabilitation legislation is a distinctly American contribution to the solution of the problem of the industrial disabled. Since workmen's compensation was adopted from the European Scheme, it did not originally include within its scope and purpose the ultimate restoration of the injured worker to complete working capacity. Through workmen's compensation and rehabilitation legislation the disabled workers' opportunity for reinstatement in industry has been considerably facilitated" (Kessler 51).

This law has led to the establishment of a rehabilitation service with numerous branches. Its possibilities have been very considerably expanded by the Security Act of 1935. According to the regulations the tuberculous also are "truly entitled to the benefit of the civilian rehabilitation service at least as much as those suffering from other types of disability" (Angrove 52). This statement is however confined to such tuberculous patients as are indisputably and certainly stabilised. "A rehabilitation programme proper of any kind should not be initiated until the person is discharged and pronounced arrested or cured." (Angrove.)

The number of tuberculous rehabilitated as a result of this law, as can easily be understood, is as yet extremely small. In 1929 there were among the 5,000 people rehabilitated only 204 with tuberculosis records. The number of all those

disabled is so great that the rehabilitation authorities have been unwilling to deal more extensively with tuberculosis on account of the numerous failures and relapses.

In the last few years more and more joint committees of the local or State tuberculosis organisation and the rehabilitation authorities have been formed. The means at the disposal of the rehabilitation service are used to provide financial assistance towards vocational training, even in the period of industrial convalescence. (Kessler.) Information as to the remarkable success of this co-operation may be found in a number of publications especially devoted to this problem. Here, all is still in process of construction. It is understandable that there is a present tendency to over-emphasize the technical problems (ability tests, vocational training). The main thing is that this co-operation has been established and must now be carried further by the tuberculosis organisations.

One of the most essential duties of this rehabilitation service is the "placing" of the stabilised arrested cases. This placing was originally the weak point in rehabilitation. This is perfectly comprehensible when one remembers that the stabilised + - ex-patient used to be rare and could as a rule dispose of himself whereas the majority of the cases which were looking for work through a placement bureau were ++ cases, unemployable or not yet employable. It can be said that the placing of the tuberculous has in fact developed but little even to-day and the chief obstacle has been the lack of an intermediate stage of industrial convalescence.

Renewed efforts are being made to place in suitable employment the arrested cases which present more and more a major problem. In Germany, it is the function of the Labour Exchanges to place these ex-patients in suitable employment after their complete stabilisation.

In France, the Union of Ex-patients of Sanatoria, which are linked up with the "Fédération des Amicales," endeavours in collaboration with the "Ligue pour la Réadaptation du Physique Diminué," to find employment for their comrades through private and public initiative. (Guinard at Bligny.)

In the Anglo-Saxon countries attempts are being made to organise a movement on a large scale for these ex-patients to be taken over by the sanatoria as employees on their staffs. According to the records of the Employment Committee and to the Memorandum of the Tuberculosis Association in the U.S.A. many tuberculous ex-patients (3,500 in U.S.A.) are employed in sanatoria. But until we have a detailed clinical analysis of the condition of the ex-patients employed in sanatoria these figures must remain comparatively unimportant.

Sheltered environment and segregation of the bad chronic case.

Of the ++ cases surviving after two years, one group has been characterised as only partially fit or unfit for work. Even though they have survived for two years there are few of them who have any prospect of surviving ten years. As has already been mentioned, it is possible to prolong considerably the life of these patients by means of after-care. If it were possible to segregate these patients, until their deaths (without their working capacity being utilised) in institutions or even in their own home by adapting their environment and living conditions, the utilisation of their earning capacity would never have become a problem. Where such segregation is possible, full advantage should be taken of this possibility. Unfortunately, both psychological and economic reasons have prevented the success of any large scale attempt to put this idea into practice.

If these incurable tuberculous patients are living under miserable conditions, tending to the spread of the disease, the utilisation of their remaining working capacity is obviously desirable if by that means they can be induced to live in healthy

conditions. For in this way the standard of living of the family can at least be kept at a high level. But it would be a mistake to create urban settlements for such cases, as has been attempted in Germany at Bielefeld, etc., *without securing employment*.

The bringing together into a settlement of numerous fellow-sufferers whose lives cannot be much prolonged has many disadvantages and has often led to complete failure. Such a measure always increases the cost of living which can never be met by the usual pensions, even when these are supplemented by some form of additional assistance. Moreover, the element of mass psychology, when incurable sufferers are so concentrated must not be underestimated.

A model plan for a "Housing Scheme" has been carried out in Stettin by the local Tuberculosis Association responsible for all the anti-tuberculosis measures in this area. This plan provided for the occupation of dwellings for the tuberculous among the dwelling houses in the newly built suburbs, the association renting the flat and sub-letting it to the tuberculous family. The added rent which became necessary for the provision of a sick room and of a somehow larger sitting room, and the generally higher expenses can be thought of as an expense which may offset the charges for repeated and useless periods in sanatoria or hospitals of these ++ cases. As Braeuning informs us, contact infections with their clinical consequences did not take place, so that these prophylactic measures saved the children. There has been no question of colonisation in industrial settlements for such cases, because the progressive course of the disease creates complications (wage-deficiency, infection, admissions into hospital) which endangers the principles of an industrial village settlement.

In the After-Care Settlement of Breslau-Herrnprotsch about ten such families had to be admitted when the 32 dwelling houses were first ready for occupation because the living conditions of these families were so poor that the management thought medical considerations ought to be disregarded in their favour. The result was that these patients, in spite of their more and more serious state of health, refused passionately to give up work, just in order that they might receive a wage which never corresponded to the work they had accomplished. When soon they became bed-ridden, it was impossible to persuade them to be transferred to the Sanatorium-Hospital. Finally the paradox was reached, that the families hardest hit, and with the heaviest expenses, had a completely inadequate standard of living, which could not be remedied even by means of the relief fund which the settlers had founded among themselves. Consequently, with so large a number of serious cases the strain on the economic resources of the working settlers became overburdened. Finally it was observed that in three of these families children were born in the last year of life of the father; these children became diseased with primary infiltration.

The hospital section of a village settlement can be used for the segregation of a certain number of advanced bed-ridden cases with great advantage. Care must be taken however to ensure a proper proportion of such cases being admitted. The psychological effect of the atmosphere of a village settlement ensures the life-long stay of such a patient with its obvious advantages. Homes for the dying have not this right atmosphere and patients will naturally not stay. This criticism certainly does not apply to village settlements where every case can see before him the vista of security and progress governing his recovery. In this, Papworth is an outstanding example.

The idea of urban settlement schemes for tuberculous invalids have been based on a mistaken humanitarianism and a mistaken conception of the idea of an industrial settlement for the tuberculous and may easily lead to precisely the converse of the

results intended; so far as married patients are concerned the inadequacy of the economic provision for these cases would become still more evident. In such cases it is better to provide for good housing conditions and intensified carework such as the Handicraft Classes organised in England to-day in the various dispensary districts under the supervision of the dispensaries. These classes are occupational therapy centres and a means of influencing the mental attitude of the patients. They serve the purpose of getting into closer contact with them, of giving them such conditions that one can ask something of them in return, namely, a mode of life which accords with social hygiene. These Handicraft Classes are not industrial centres but provision is made for the members to obtain some remuneration.

The *unmarried* patient must be regarded from the point of view of after-care as falling into a category quite distinct from that of married persons. Certainly, it would be wrong to admit progressive cases into one of these industrial settlements. But there is none the less a far greater freedom of action in this case, especially when dealing with any intermediate group. Any form of permanent segregation has until now failed almost entirely with the single chronic cases. The institutional segregation of invalids in sanatoria or in institutions usually fails because of the premature departure of the patients. Only in the rarest cases is it permanent. But the expense of such segregation can only be justified if the latter is effective. Compulsory segregation as a general solution has indeed been frequently discussed but has never been established by law.

The institution of municipal hostels for single tuberculous persons is an attempt which has up till now failed completely and is bound to fail. The time of these totally unemployable patients cannot be occupied. Homes of this sort will have to become after-care homes with industrial workshops and preferably attached to a sanatorium.

In our statistical considerations we have found that the group of patients which is expected to succumb from two to ten years after their discharge is steadily though slowly diminishing. (In the Bilthoven-statistics of 1932-1935 it amounts only to a small percentage.) The duration of life and the resistance of the non-stabilised cases is increasing. This may be one reason why the assignment of open cases to the industrial settlements of Papworth and Preston Hall (England) no longer confines itself to cases which fall within the group of good chronic cases. "In addition to the number of patients accepted as permanent settlers at the village settlement, there is a certain number of settlers for whom, owing to their permanent disability, a weekly partial maintenance scheme is paid and such settlers are regarded as continuing to receive residential treatment under the Tuberculosis Scheme" (L.C.C. Report 53).

Re-employment of the good chronic case.

After the stabilised $+-$ cases and the dying $++$ cases have been eliminated, the middle group of the good chronic cases composed of the $++$ cases and the relapsed $+-$ cases which fail to respond to temporary after-care, narrows down up to a certain point. But the number of cases to be subtracted is less than in the earlier period as has been shown in our statistical analysis. Many of these good chronic cases return to their former employment in their old occupations. *The majority and particularly the young workers are unemployable in normal industrial life.*

According to the generally held views of the rehabilitation service and of general hygiene, the open tuberculous cannot be placed in jobs. Industry refuses to employ them. The Employment Committee of the Joint Tuberculosis Council sent a questionnaire to 220 employers, asking whether they would employ in their

industries 1% of bacillary part-time workers. Only 25% answered and these answers contained decided refusals.

If the question of engaging the worker is left to the employer, the one and only important point for the latter is the working capacity offered. As long as he has enough fit workers at his disposal there is no reason why he should employ disabled workers. If there is a greater demand for workers on the labour market, even disabled workers find employment without any attention being paid to their condition and decreased working capacity (Report IV, Joint Tuberculosis Council).

If one wished to place the open tuberculous in jobs systematically, one would have to make special provision for them. This is possible in normal industries when measures are taken to provide both sheltered employment for the tuberculous and at the same time protection for his fellow-workers.

Ford was the first to set an example, when in 1920 he employed tuberculous workers in a special department to sort screws, etc., and thus made full use of their decreased working capacity. After the mechanisation of industry had been introduced in the German Railway Workshops at Dessau, it was possible to employ ex-patients of the sanatorium who formerly were unemployable (Ascher). In Russia, according to some recent publications, the earning capacity of the tuberculous has been to a great extent successfully utilised in normal industry through special adaptation (part-time work, separate dining and resting rooms, special diet). At one Russian mine, so we are told, 90% of the tuberculous mechanical workers were 50% more efficient than the average healthy worker in the same department, whereas of the healthy miners only 60% had more than 100% efficiency. But we do not know with what form of tuberculosis these facts are concerned and whether any open cases are among the workers.

The attempt to place stabilised chronic infectious cases on the staffs of sanatoria has small prospect of success (c.f. Employment Committee Report III).

We may therefore say that under present day conditions there is as yet in normal industrial life no chance of obtaining for open cases sheltered employment or, indeed, any employment.

In consideration of the general shortage of work, it ought to be possible to suggest eliminating the chronic infectious tuberculous altogether from industrial life. This systematic and compulsory elimination of the open tuberculous from industrial life presupposes the recognition of maintenance as a duty of the State. Only the guarantee of an absolutely normal wage can make the tuberculous renounce their right to work. This principle is actually admitted for limited groups of individuals in particularly endangering professions. In Switzerland teachers who have to resign because of tuberculosis receive their full salary.

In Switzerland and in France tuberculous ex-soldiers receive a 100% compensation which however does not always correspond exactly to their former income. It would seem an obvious course to pay full salary to the open tuberculous without utilising their earning capacity in order to save the special expenses for sheltered employment and instead of spending money in utilising their earning capacity at a time when healthy people are workless. But this is not done.

Moreover unemployment is an abnormal situation upon which no health policy can be built up. We have now-a-days to reckon with the fact that the open tuberculous who are capable of earning are either employed in professions unsuitable both for themselves and for their fellow workers or unemployed and therefore living in conditions which are unsuitable for themselves, their families and their

environment ; and there seems no method possible for the authorities to incorporate these patients systematically into industrial life, so that the maximum use could be made of their economic value.

This is the main reason for the building up of special industries which provide permanent sheltered employment for the tuberculous. This question is all the more urgent as, according to our statistical calculations, the number of those cases increases rather than diminishes, as methods of treatment improve, this group now forming about 30% of the ex-patients of sanatoria.

The utilisation of the earning capacity of the "middle" cases is a sociological problem of the first magnitude. Treatment and temporary after-care remain incomplete until the problem of vocational rehabilitation has been solved.

The chronic open case is the ideal case for a sanatorial village settlement. He is a stable worker, whose powers of endurance are relatively good ; his expectation of life is sufficient to justify the permanent regulating of his sociological status; and he is the middle case, the good chronic case, who would if he were allowed to do so, probably use his working capacity to earn a living, even under certain conditions of normal industrial life. Since, however, no adequate opportunity is provided for him, the sheltered industries are at present the only places where he can earn his living. There, money spent on his rehabilitation is repaid and the prevention of contact infection saves similar expenditure in the next generation.

"The ambulant and apyrexia sputum positive case comes within the scope of the scheme and having regard to the experiences gained at existing settlements, some extension of the village settlement principle might be attempted for such of those persons as cannot be absorbed in normal industry." (MacDougall).

Up to the present time sufficient attention has not been paid to the fact that this group of tuberculous patients is in number and in social hygienic importance at least equal to the group of arrested cases for whom adequate conditions can be procured in normal industrial life, and also to the group of progressive ++ cases for whom social hygienic measures must be made.

CHAPTER 5.

Sheltered Industries.

Four categories of ex-patients of sanatoria mentioned above need sheltered employment in a form which so far has been provided only in sheltered industries.

Two categories, those needing industrial convalescence until stabilisation, those needing segregation until death, need temporary sheltered employment for a limited period.

The other two categories, the stabilised ++ cases and the not sufficiently stabilised +- cases, the +-+ cases, need it permanently as a form of existence, in fact as the only form of existence which is called for under present conditions when a systematic rehabilitation is necessary. They pass from temporary to permanent sheltered employment as soon as the critical years are over and a certain degree of stabilisation obtained.

Sheltered industries will vary in size and organisation according to whether they are designed more for temporary or for permanent after-care, but their essential principles will be the same. The same principles of commercial organisation which make for industrial perfection must be maintained.

Any dilettantism in industry leads to physical and financial disaster. If the patients do not take the work seriously and are not convinced that their existence is indissolubly bound up with that of the industry, the undertaking fails in its purpose and medical success cannot be attained either. The patient is only too prone to consider one of these pseudo-industries as a game in which he takes part in order to get money which he would not otherwise receive, or to feel he is being exploited. The industry can only be built up and maintained if the nucleus of workers is interested in the undertaking and sure of its success. This result can only be achieved by building up and running an industrial organisation in the commercial sense.

It seems paradoxical to replace manual labour by machinery in these undertakings, for it may be thought that in this way the expenditure is increased and the number of workers diminished. But in an industry which is not sufficiently rationalised, the utilisation of the working capacity very quickly reaches the line where, even when the maximum of work is accomplished, the pay is hardly higher than the normal public assistance rates. These small scale undertakings have, it is true, the advantage of needing but a small capital, but they have no attraction for patients, for they cannot provide them with a living wage.

On the other hand, a rationalised undertaking requires a comparatively high expenditure of capital for work rooms and machinery, a fairly large turnover in order that the machinery and the space can be utilised, and at the same time a certain nucleus of workers who are sufficiently experienced to permit the smooth working of production. It was formerly thought that the sanatorium workshops could be of service in the building up of temporary sheltered employment, but, for the reasons given above, this is now out of the question. The problem is not the establishment of small workshops but the foundation of an industry for substandard workers. "Basing action upon theory we were driven to the construction of large workshops

fitted with the most modern machines. By their help, we felt sure that the disabled would be able to earn their living. It is even yet hardly realised what a revolutionary departure it was from the view generally held, namely, that the disabled should try and learn some simple craft, and that the article made in the process should be sold to sympathetic customers at bazaars and other charity functions . . . All subsequent experience has shown beyond question that, without up-to-date workshops the employment of the disabled on anything like a self-supporting basis is an impossibility. The Industries at Papworth have continued to use machinery to compensate disability and the sales organisation has found a market." (Varrier-Jones 55.)

The expenditure of capital necessitated by such rationalisation must be provided by public or private means. It is a mistake to expect an industry staffed with sub-standard workers to provide its own capital like normal industry. (Varrier-Jones.)

The sheltered industry is a form of organisation rendering a definite social medical service. Society cannot decline all responsibility towards these services. The best investment return on the capital is to use it in such a way that other, still greater expenses are avoided and the results are such as can be attained in no other way.

For the institution which concentrates on temporary sheltered employment, the problem of the expenditure of capital is comparatively easy to solve. Just as the provision of a bed in a surgical ward requires to-day the expenditure of about £500, likewise the establishment in an after-care department of working quarters (which are used by many patients in succession) requires certain capital expenditure. As the sum required is not excessive, what can be saved on one side by the simplicity of the accommodation (shelter, hostel), can and must be spent on the fitting out of the working quarters and workshops. Where a close local and administrative connection with a central sanatorium is established, general costs (heating, meals, nursing, and medical attention) are considerably reduced.

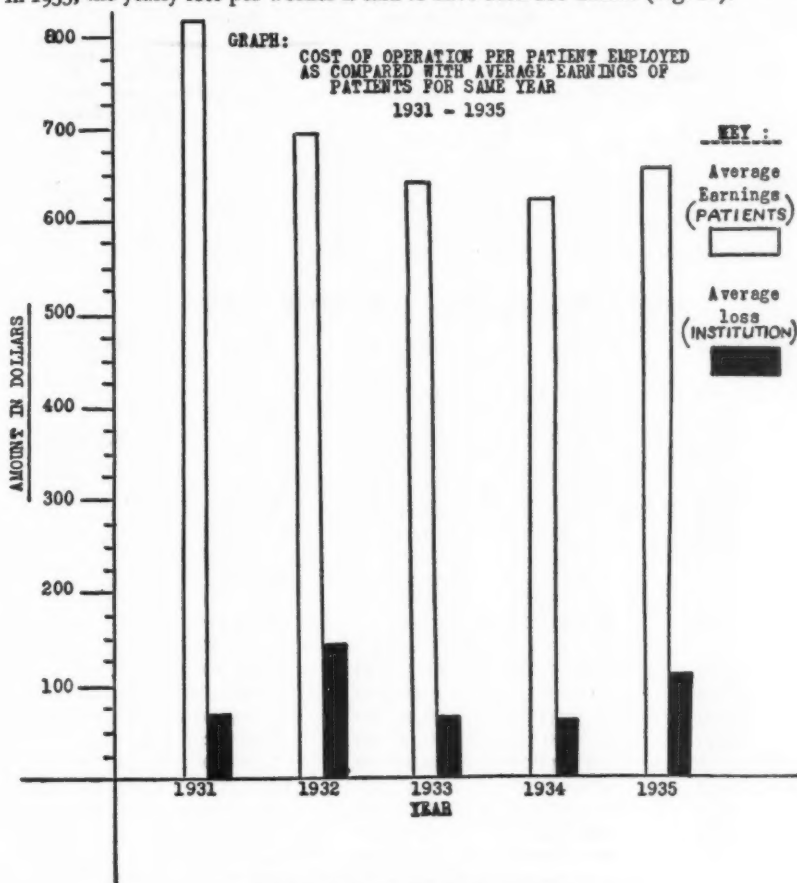
"More and more local authorities are taking advantage of the scheme, for they realise that treatment, thus prolonged under Village settlement conditions gives their patients a greater chance of acquiring resistance. There seems to be at last a slowly growing realisation of the fact that it is actually cheaper, as well as far better, to secure settlement for larger numbers of tuberculous persons and their families than to continue the apparently cheaper but eventually far more expensive practice of sending them back prematurely to their homes." (Varrier-Jones 56.)

In the Memorandum on : Local Authorities and Village Settlements for the Tuberculous, the services rendered by the village settlements are brought to the notice of the Local Authorities. (MacDougall).

If the Local Authorities guarantee to pay the same assistance rates (£75 a year for married people and £50 for the single) a village settlement could be built up with a self-supporting industry and this would be of greater service to the settlers than if they received the same amount in the form of public assistance. Each of these sheltered industries starts with a handicap, since social medical services are demanded and must be provided. If such an undertaking is to carry on like a normal industry, this handicap must be compensated. In running sheltered industries the public does not only save money, but employs the means at its disposal in a more systematic and economical way. The sheltered industries are self-supporting, that is, they pay Trade Union wages to their employees out of their turnover.

The accounts of the Altro-Workshop (57), New York, serve as an example. From 1915-35 this undertaking has increased its turnover from 4,129 to 229,824 dollars. The proportion of wages has become quite satisfactory. At the beginning

50% of the turnover was paid away in wages, in recent years only 30%. The amount lost in the years 1931-35 was reasonable and comprised about 3-5% of the turnover. In 1935, the yearly loss per worker is said to have been 100 dollars (Fig. 16).



From the Altro Workshop Report, 1936

Fig. 19

It is moreover a principle of the Altro-Workshop to pay the weekly salary of a normal worker to their substandard employees, even if, for reasons of health, full time work is not done. The monthly contribution for the compensation of part-time workers, which is provided by a welfare fund, amounted to 28 dollars when the wage was 54 dollars (total 72 dollars). (Fig. 16.) Thus the standard of living of a skilled worker is guaranteed to the substandard worker. Provision is also made in the Altro-Workshop for social medical service. "The rate of pay is the best rate paid by commercial factories. Pay is based on production and never lower than Trade Union piece rate for similar work" (Hochhauser).

ALTRO WORKSHOPS, NEW YORK CITY.

Year.	Sales.	Number Patients Employed	Patients' Earnings		Relief			Average Income Per Patient Employed
			Total.	Average Per Month.	Total	Per Patient Employed	Per Patient Receiving Relief	
	\$		\$	\$	\$	\$	\$	\$
1931	286,243	122	102,698	70	29,759	20	38	90
1932	210,134	118	82,283	58	30,515	21	42	79
1933	207,543	117	75,143	54	30,450	22	31	76
1934	226,634	127	79,649	52	29,595	19	30	71
1935	229,824	129	83,026	54	27,771	18	28	72

ALTRO WORKSHOPS—NEW YORK CITY.

Year.	Sales.	Wages.	Loss.	Profit.
	\$	\$	\$	\$
1915	4,129.44	7,865.49	6,163.41	
1916	29,330.69	24,636.78	9,177.95	
1917	73,844.13	60,061.52		2,386.23
1918*	180,928.01	111,327.00		3,360.26
1919	130,174.99	65,903.80	17,793.89	
1920	83,406.82	56,538.96	6,730.16	
1921	78,945.32	39,941.98	13,786.47	
1922	116,918.01	36,292.00	230.58	
1923	134,152.67	41,510.00	10,780.67	
1924	128,815.18	36,442.00	9,508.09	
1925	164,220.19	52,082.63	10,742.06	
1926	204,410.00	68,156.78	11,233.07	
1927	232,351.00	81,318.00	10,242.06	
1928	242,498.00	79,679.00	8,847.01	
1929	275,932.00	96,204.00	1,504.68	
1930	288,681.00	96,158.00	6,647.22	
1931	286,243.00	102,698.00	8,396.50	
1932	210,134.00	82,283.00	15,759.00	
1933	207,543.00	75,143.00	7,520.00	
1934	226,634.00	79,649.00	7,764.25	
1935	229,824.00	85,026.00	13,296.90	
Total	3,529,715.45	1,378,916.94	176,123.97	5,746.49

It would be illogical to expect the worker to earn the whole of his living himself since his handicap is also a financial handicap for the industry as it shortens his working hours. Nevertheless, the requisitioned amount which the community has to contribute, is not higher than that which it would have to pay in unemployment relief; and the latter method would not afford the tuberculous worker anything approaching the same standard of living, it would not fulfil the functions of social medicine, and it would not use his earning capacity in the interest of economics.

*1918—actual wages paid was \$148,436—estimated that 25% was paid to non-patients employed on navy work shirts.

In the case of the married man, the Altro-Workshop proceeds on the principle that "the patient is treated as a sick man trying to get well and not as a dependent whose desire to work is being tested."

A factor of sheltered employment in independent industries which ought not to be underestimated, is that of providing sheltered environment for the families as well as for the single people, as soon as they become employees. This is done by constructing a special type of housing scheme, preferably in the vicinity of a sanatorium. When the standard of living corresponds to that of a prosperous worker, it is easy to obtain an epidemiological effect of the first order. In this way the centres of infection are removed from the general mass of the working population and placed in an environment in which, as experience has shown, the family epidemic is extinguished. This is a consistent continuation of a policy for decreasing still further the higher morbidity among the working classes, and to lower still further the high rate of mortality from tuberculosis in those classes. The experience of the large settlements of Papworth and Preston Hall and of the small settlement at Herrnpotsch has shown that "mass" infection can be prevented altogether and contact infection made so much milder, that no malignant forms are observed and even passing manifestations remain decidedly rare.

The numbers of days of illness is considerably reduced by this sheltered employment and environment, and the general efficiency increased. It is very hard to estimate how many days a year are lost from work through illness in the case of ex-patients who do not live in a sheltered environment. From the statistics of insured workers, we may assume that on an average a tuberculous worker has roughly 100 days of illness in a year. This figure is relatively high, because it includes the new cases. But even in an industry which provides special care for its ex-patients (Metropolitan Life Insurance Co., U.S.A.) one must reckon with an increased number of days of illness.

Days of illness per head per year :

	TB. ex-patients	Male	21.4	Female	42.2	} All ages
Non	" employees	"	8.6	"	13	
The difference is particularly great in the year groups of those over 45 :						
	TB. ex-patients	Male	40.8	Female	72.7	
Non	" employees	"	12.1	"	24.3	
Under 45 years of age :						
	TB. ex-patients	Male	14.5	Female	35.8	
Non	" employees	"	8.0	"	12.3	

Of these days of illness, 67% were on account of tuberculosis.

"The major cost is wages lost and sick benefit paid during disability. This amounted to 79.8% of all service expense." (Sawyer and Richard 58).

Through the introduction of part-time work, these days of illness can be greatly reduced even in normal industrial life. Ascher (59) has shown the figures are too small for generalisation, but five tuberculous workers in whose files 2,290 days of illness were entered, had in the course of one year after the introduction of part-time work, only 60 days of illness on the register. It is possible that the fear of discharge during this period of economic crisis played a certain part. "But nevertheless, it can be seen from the reports of the social worker, that unemployment or part-time work had a favourable effect on the course of the disease on account of the enforced leisure."

Part time work and rationalised work if not accompanied by a corresponding decrease in the standard of living is beyond doubt one of the strongest guarantees for the maintenance of the earning capacity of the tuberculous worker.

The *market* for the products of the sheltered industries, must either be guaranteed by a sort of official monopoly or gained in normal industrial competition.

In the latter case, the industries must find their own markets. If they confine themselves to turning out inferior and more expensive products than those already made by other firms, they will be lost in the economic struggle. To subsidise these undertakings, which are unfit for competition would be unreasonable. Subsidies should only be used to procure capital for working quarters and machinery and not for the covering of losses which are due to a badly organised industry. The sheltered industries must find and maintain their market through their own initiative and new inventions, understand the needs of customers and by continual improvement of their products and their methods, maintain their position. All the industries which have made good to-day have found new markets and gained a name and reputation, which are in no way connected with charity. Papworth Industries is a firm whose name is a guarantee of quality. Ado-Products are asked for without the customer thinking of the origin of the goods.

In common with other industries, the reputation of these sheltered industries is based on certain specialities. Papworth Industries have become well-known through their suitcase and trunk department. Papworth has for years had a stand at the British Fair in London and exports to Holland, Germany, France, America, etc. With German machines, Varrier-Jones has founded a branch of industry which on account of the preference given to English leatherwork, has to take in hand further development to supply an expanding market.

This is a typical example of the kind of initiative required to produce an article which had been chiefly produced abroad, by importing machinery and selling the produce at home and abroad. The case of the wood-graining industry in Preston Hall is similar. Here, too, the machinery was imported and a product made for which there is a great demand in England and the Empire.

The Ado-Workshop (Bilthoven) is a special toy factory whose products are known to the customer as Ado-Toys. A book binding shop which has specialised in artistic binding of high value for bibliophiles has thus acquired a kind of monopoly and a reputation which also brings in orders for ordinary book binding work.

At Zonnestraat, special machinery has been procured in order to undertake certain supplementary work of the diamond industry, machinery which was originally made in Belgium. This machinery was quickly improved, its efficiency being considerably increased. By these means a market was gained.

The Altro Workshop, New York, produces all kinds of uniforms for hospitals, restaurants, hotels, etc. Its products are well known under the name "Sterigarn."

The industrial settlement Herrnprottsch has specialised in the construction of steel furniture and built-up a reputation which has facilitated the selling of hospital furniture of all kinds.

The industries of the aftercare department of the Peamount Sanatorium (Ireland) specialise in the manufacture of gloves with very great success.

Each of these industries has made itself known through special articles and built up a reputation which automatically opened the market for its other products. New technical methods or new patents are the means of expansion. Thus, these industries cannot be accused of having taken advantage of the fact that they are subsidised to supplant normal existing industries.

Among so many tuberculous there are experts of all kinds, artists, artistic craftsmen, engineers, etc., and there are many possibilities for first class products which are in some way more beautiful, more useful and not more expensive than others on the market.

The development of the Papworth Industries is again an example of this. They have become specialists in poultry farming appliances. New inventions are tried and patented while the old products are still in demand. Papworth follows the example of the big general stores and finds out the needs of the customers by continual study. There must be no stagnation. To stand still, in this case, is to fall back.

It is obvious that the *keymen* in these industries cannot be continually changing—in other words, that a nucleus of workers is required who are permanent employees of the undertaking. That means, that for a certain group employment must be permanent. This group will vary in size according to the nature of the industry. The automatic result of this is the settling of the keymen in a sort of industrial settlement, this is the *raison d'être* of the village settlements. A sheltered industry is always combining permanent and temporary employment. The proportion of temporary workers and permanent employees is fixed according to the particular conditions, the nature of the industry and its position in the social medical system. In general, temporary sheltered employment is still considered a part of treatment. If the character of the undertaking is determined by its social therapeutic or hygienic functions, so that it has principally the character of a sanatorium or hospital, the workers in the temporary employment stage will have no right to claim a full wage. Work performed and wages paid can be made to correspond only if regulated according to a fixed scale. The function of the industry is to provide a livelihood for as many stabilised workers as possible—if therefore, the industrial character is predominant, the Trade Union will insist upon the workers in these industries being paid normal wages, even if they are only employed there temporarily, so long as they work regularly for several hours a day.

The whole wage policy of the village settlements is to pay maximum wages and while providing healthy living conditions, keep the cost of living at a low level. A tuberculous family in a slum dwelling will have largely adjusted itself to its environment, so that it can just exist on poor relief rates, although all social requirements are neglected.

A working wage hardly higher than the poor relief rates, does not encourage the tuberculous to work. On the other hand, his admittance into a settlement means a higher standard of living and this in turn means higher wages to meet this new scale of living. Therefore, provided an incentive to live under better conditions, the willing co-operation of the tuberculous patient and his family can be secured.

Economists have pointed out that a similar problem exists in the re-employment of the unemployed. There is a large group of young unemployed workers who prefer unemployment to badly paid work, because all resumption of work is accompanied by expenses which eat up the money additionally obtained.

Therefore, whenever a process of rehabilitation takes place, the income and the expenses of the family must be so harmonised as to ensure a raised standard of living. This means maximum wages, financial compensation of part-time work, and decrease in the general cost of living; all these conditions are most easily obtainable in a village settlement.

CHAPTER 6

Costs to Community.

It is now possible to estimate approximately which of the following alternatives is the more expensive for the public: a combined scheme of physical and economic rehabilitation or sanatorium treatment and "laissez faire."

If the idea of carrying through a complete programme of rehabilitation is given up, the social medical results remain incomplete, and expenses uncertain in amount, but certainly heavy, will have to be met.

Somewhat more detailed information is to be found in a calculation made by the Manitoba Sanatorium, Hamilton, Canada, where about 1,000-2,000 dollars were spent in each case per year.

(3,881.85 dollars for two years in one case
8,545.00 " four " another).

According to the enquiries made by A. W. Sawyer and E. K. Richard, the loss on an average was about 3,000-4,000 dollars in each case. The major part of the cost was due to working days lost (26%), sick benefit (0.4), estimated time lost (33.4%) and sanatorium and hospital treatment (16.2%).

Newsholme estimates the loss to the community through each tuberculous person at £150 a year.

A similar calculation has been made for the inmates of the tuberculosis settlement Herrnprottsch. The expenditure necessary for sanatorium or hospital treatment ranged between RM. 3,000 and RM. 9,000 per patient. Almost all these patients had since their first admission to a sanatorium, spent about three months of each year under institutional care.

"Of the fifty-eight million dollars spent each year on sanatorium care, approximately twelve million dollars is spent on those who have had previous sanatorium care. The high rate of relapse with its attendant large expenditure indicates a weakness either in medical or social treatment or in both" (Burhoe 60).

A detailed social analysis of the settlers employed at Papworth confirms the fact, that the tuberculous, in the course of his disease, repeatedly enters sanatoria and hospitals. The cost of such disconnected courses of treatment equals or exceeds that of full rehabilitation.

It is possible to determine as we have shown above, the cost of an organisation which provides temporary or permanent sheltered employment, and which, when discharging patients, takes as their standard complete rehabilitation. When the organisation is efficient, the public assistance rates, which are based on a minimum standard of living, make possible the financing of a complete programme of rehabilitation, when work can be assured.

If it were possible and desirable to pay the equivalent of a full wage to the tuberculous worker instead of giving them work, one would not achieve on those lines the same social medical and social hygienic results as can be attained with smaller expenditure through the provision of work. From the standpoint of economics

alone, this programme may seem unsound. "To expect the community to make any extensive plans for the part-time or sheltered employment of the tuberculous, while there are armies of able-bodied unemployed is certainly optimistic on the part of those concerned with the rehabilitation of the handicapped. It is not going to happen, because it is economically unsound" (Burhoe 61).

Questions concerning social hygiene, must not be decided by industrial economics alone.

Two entirely different problems are involved. Unemployment is a serious problem of international economics. And, yet, even to-day, increased rationalisation, efforts to raise the birth-rate, general treatment of disease, industrial hygiene, continued improvement of the working conditions for women and young people, are taking place in all countries, thus increasing the capacity for production without considering the consequent reaction on the labour market.

If the considerations of the labour market were the decisive factor in rehabilitation, the tuberculous worker would be drawn into the whirlpool of industrial strain, when labour is needed, with no thought of social hygiene, and be the first to be eliminated when work is short. "The alteration in the economic position of the country has if anything shown that when industry is more prosperous many of the qualms of industrial concerns towards infection and substandard labour are subdued in their desire to obtain labour of almost any kind or description." (IV. Report of the Employment Committee 62).

Health measures must however be taken independently of the fluctuation of the labour market, and a straight course of social medical work must be pursued. Obviously all health measures are handicapped in times of economic crisis. But during this period of crisis the tuberculous worker is eliminated from the economic process in accordance with the law of the survival of the fittest. Thus it is precisely such a period which offers the best prospects of excluding the tuberculous from industrial life and of utilising his enforced leisure for an intensive post-cure and of industrial convalescence.

Social medicine must not fail to seize the favourable moment at which the tuberculous, seeing here their only chance of existence, are ready to accept help and to co-operate in each of the experiments for the improvement of national health. If this opportunity is allowed to pass, improvement in the economic conditions may again encourage the tuberculous worker to conceal his disease, to the detriment of the national health and the national Exchequer.

The scientific material for the foundation of a Rehabilitation legislation for the tuberculous is certainly very incomplete at present. "Rehabilitation has not kept pace with the preventive and curative faces of the sanatorium service . . . The problem, as a whole, is well worthy of further study. It is concerned with the cost of tuberculosis hospitalisation and with the responsibility of individual institutions in the post-sanatorium care of patients. Likewise, it involves the community's responsibility towards patients who remain physically handicapped and unable to compete on even terms in industry and other occupations" (63). It is to be hoped that the experience gained in the sheltered industries will help to set up a complete system of industrial pathology, physiology, economy and thus prepare a rehabilitation legislation for the tuberculous workers.

Until legislation stating the right of the tuberculous to work has been introduced, and until it has been realized that the utilisation of his earning capacity does not relieve society of responsibility for him, the anti-tuberculosis system will remain imperfect and rehabilitation impossible.

PART III.

The Multiple Unit for Institutional Care and After-care

CHAPTER 1.

Preliminary Experiments.

The Edinburgh Scheme.

The historical development of Anti-tuberculosis Schemes teaches us that the threefold problem involved in institutional care and after-care has been recognised for a long time. In the Edinburgh Scheme of Sir Robert Philip provision was made for *independent* units to be created for each of these problems: the *Sanatorium* was to be reserved for the curative treatment, the *Hospital* for institutional segregation, the *Training Colony* for the process of transition to the normal life of wage-earning and the *Farm Colony* for the final hardening off.

The organisation of treatment and after-care in *distinct* units, each of which was intended for the fulfilment of one object only is a system which has not shewn itself capable of development and has not been equal to the problems set by the rehabilitation of the tuberculous person. Therefore forms of combination have been created which it was thought would meet the different problems at one and the same time.

The extension of sanatorium treatment through occupational therapy.

By the introduction of occupational therapy and the establishment of special departments for occupational therapy in Sanatoria, it was expected to combine treatment and rehabilitation without special outside organisations for after-care. In the principles which are formulated in Bulletin No. 4 of the Occupational Therapy Association U.S.A. "occupational therapy" is designated as "the matter for training the sick or injured by means of instruction and employment in productive occupation. The objects sought are to arouse interest, courage and confidence, to exercise mind and body in healthy activity; to overcome disability; and to re-establish the capacity for industrial and social usefulness." (64)

In 1921, at the fifth Meeting of the National Society for the Promotion of Occupational Therapy, the aim was still further extended. "The industrial problem of the handicapped—some day we are going to be able to harness up the fractional efforts of many thousands of people into some productive industry which will save their self-respect, which will save them from dependence and which makes it possible for them to progress morally, physically and every other way which is desirable. From these small beginnings of occupational therapy there are very, very great possibilities in the future" (Hall 65).

The original idea was evidently to build up a programme of rehabilitation on *occupational therapy*. "The initial programme was frankly only the beginning and

it seemed well to outline somewhat categorically the steps which should engage our attention looking to the development in the days and years to come of the ultimate programme for the rehabilitation." (S. C. Slagle 66).

But occupational therapy, even when it is organised in special departments and directed by "Occupational Therapists" of the highest official standing, does not necessarily extend its effects beyond the Sanatorium. Occupational Therapy Schemes are to be regarded as "intramural" and have in fact, great importance for the improvement of the atmosphere of the Sanatorium, without extending its influences far beyond its walls. "It can be said, that the greatest value assigned to it by those competent to judge, is improvement in the mental outlook of the patient. While anything that improves the mental outlook of the patient is of undisputed value in the treatment of tuberculosis, any procedure which is mainly concerned with sustaining morale must be considered inadequate in terms of actually equipping the patient for re-entering the industrial world." (Burhoe).

Occupational therapy schemes are developing from "*diversional*" therapy towards "*educational*" and "*prevocational*" therapy.

Occupational therapy as "*diversional*" therapy is of undisputed value in the struggle of physicians and patients against the atmosphere of the Sanatorium, against the psychological trauma of a chronic disease and against the mentality which in an assemblage of companions in suffering, very quickly becomes predominant without occupational therapy.

Diversional therapy schemes can reach a very high standard when organised in such a way that doctor, occupational therapist and patient co-operate in order to secure *efficiency*, in mind as well as body. Such a diversional therapy scheme may even retain its independent importance in the sanatorial section of an institution which at the same time is running an industrial after-care colony. But occupational therapy schemes are expanding their scope more and more towards *educational* therapy. The sanatorium should be a school of life (Stewart), a place of education for all those whose inadequate education makes later employment in life so very difficult.

Thus occupational therapy may be directed towards education and is only auxiliary to rehabilitation. All possible means of instruction should be used in order to raise the standard of education, (Craft Guild, Saranac Lake), by vocational instruction (Marcinelle), and even academic work (Alexander, Ågra).

A first step towards a combined scheme of treatment and vocational therapy, was made by Vos in his Sanatorium, Hellendoorn, Holland. Workshops were very often established in sanatoria but Hellendoorn organised a co-operative scheme of rest and working cure.

All these activities result in *vocational* therapy, i.e., a form of treatment applied in the last phase of sanatorium treatment. Such schemes are preliminary stages in a development directed towards *sheltered employment* and *rehabilitation*.

Training Colonies.

The *Training Colony* was the first attempt to carry out a rehabilitation programme in a special establishment, distinct from the sanatorium in situation and organisation. "This scheme provides for an institution for the exclusive reception of the early and most curable cases with a view to giving them prolonged treatment and training in some agricultural employment. Though linked up with the sanatorium from which the colonists are drawn, and with other elements of comprehensive anti-tuberculosis administration, it is designed as a separate institution. Equipped upon

simpler lines than a sanatorium, it is less costly to administer. Moreover, the patients, by performing useful work in the institution and in the grounds, gardens and farms, are able to reduce somewhat the cost of their maintenance. To give the favourable case some 12 or 18 months' institutional treatment in place of the more usual period of three or four months' treatment should, apart from any question of re-education, appreciably improve his outlook. The patient returns home, having made substantial progress on the road to recovery. With some after-care he may be expected in many instances to attempt successfully a return to his ordinary life and employment." (Bardswell 68).

At the beginning of the century, a number of such training colonies, agricultural, afforestation, market gardening and so on, were established; the idea being to harden the inmates, to accustom them to the full working day, but not to train them for a special calling.

Southfield Farm Colony.

In England, in 1910, the Southfield Farm Colony was founded in Edinburgh; it was intended to take in the convalescents of the Tuberculosis Sanatorium, the Royal Victoria Hospital. Southfield Farm Colony is still at work to-day, but only as an "occupational therapy centre" (69).

In Germany the experimental Colony of Sanum of the National Insurance Institution, founded in 1910, at Oldenburg, very soon became simply a Convalescent Home, which also accepts non-tuberculous patients. Sanum has remained an isolated experiment, with which the insurance authorities are, however, again connected to-day, but for different reasons.

Tomahawk Lake State Camp.

In the United States, in Wisconsin in 1915, the Tomahawk Lake State Camp was called into being as a centre "to which the various tuberculosis sanatoria could send discharged patients for several months' periods of hardening." The idea of combining two great plans, "the conservation of Wisconsin men and Wisconsin Forests," was very soon given up, because the State afforestation programme was altered. The camp itself has remained in existence until the present day, and has adapted itself to the change in tuberculosis thought. "The camp is maintained distinctly for the purpose of industrial convalescence, i.e. the hardening up of the patient physically, in an effort to bridge the gap between the sanatorium and normal industry. It makes no claim to vocational rehabilitation, although this is not ignored in special cases, but it leads the patient up to the point where he may have the physical, mental and spiritual stamina to come back" (Pattison 70). Tomahawk Lake Camp is in the stage of reorganisation. It is under the control of the Medical Director of State Sanatorium of Wisconsin and works in connection with the State Rehabilitation Bureau, which organises vocational courses for particular groups of patients.

Hairmyres Colony.

Hairmyres Farm Colony in Scotland, which was founded in 1916 by F. Johnstone as a Farm Training Colony within the meaning of the Edinburgh Scheme, has a State afforestation plan. It was a typical farm colony, giving a course of training as well as treatment, and took in ex-patients from other sanatoria. But as early as 1919, F. Johnstone (71) the founder and director, reorganised the undertaking on a different basis.

A sanatorium of 250 beds was set up and the work of agriculture and forestry was left to healthy employees and an "industrial workshop" for the ex-patients was established; the Annual Report of 1933 describes this "industrial workshop"

as one of the outstanding features of the colony. "The workshop takes a unique place in the colony scheme," and provides occupation for about 50 patients. Hairmyres is to-day a Hospital-Sanatorium with an After-care Colony, in which the ex-patients work in workshops. As early as 1929 an attempt was made to establish a small settlement for ex-patients, in order to solve the increasingly urgent question of "adequate re-employment" of ex-patients. In the Annual Reports the necessity of solving this question is repeatedly pointed out.

To-day the training colonies are being replaced by a new type of institution, a combined form of hospital, sanatorium, training colony and industrial centre.

Colonies.

The permanent settlement of the tuberculous in independent communities freed from an "institutional life" is van Utopian ideal, which for decades has hovered in the imagination of doctors and laymen and the patients themselves. The pattern for these ideas was found in the great health resorts, such as Davos, Goerbersdorf, Saranac Lake, in which in the course of years a large number of tuberculous ex-patients of the sanatoria had settled and had found a satisfactory economic existence. Bardswell in his book indicates the possibility of founding farm colonies for tuberculous ex-patients in analogy with the Salvation Army's great settlement for the unemployed, which he describes in detail.

Kinson Farm Colony.

It is on his initiative that the Kinson Farm Colony was started. With the help of the Y.M.C.A. an agricultural colony was established in 1916 at Kinson, near Bournemouth, with the intention of dividing up the land into settlers' holdings after the ex-patients' training was completed. At the instance of the Ministry of Pensions the management underwent a change in 1918: ex-soldiers who had finished their sanatorium treatment, and were tubercle negative on discharge and who were capable of working six hours a day, were passed on to Kinson. In 1920, 40 acres were divided up into settlers' holdings of two to five acres (rent £2 per acre) and a house built at the expense of the State was let to the settlers for a rent of £20 per year. "It is remarkable that the experience gained at Kinson supports the argument that occupational re-education of Tb. men to be effective must be combined with a programme that will secure for them a future and permanent occupation." (72)

The Kinson experiment has been successful with a very small number of ex-servicemen, but has not been repeated, because the idea of the farm settlement has been abandoned as economically unsuitable for the tuberculous in general.

Campagne-les-Bains.

In France, too, a limited experiment has had a similar result. In 1916, Dr. Roux founded his "Hôpital sanitaire et l'école de réadaptation à la vie rurale pour tuberculeux." Here, the central organisation for the welfare of tuberculous ex-servicemen sent 82 ex-patients to the settlement and of these 22 were finally able to be settled on small holdings. This result which was considered so unsatisfactory led Roux as long ago as 1921 to make it a rule that each person admitted to the institution shall in the first place remain at least 14 days in the sanatorium and must undertake to remain if necessary a year in the training colony, and to go back to the sanatorium if he does not prove himself suitable for colonisation; in other words, it is recognised as the fundamental principle that a permanent settlement of tuberculous people as an independent institution is not capable of existence except in connection with a sanatorium and a training centre. (73)

Garden Cities for the Tuberculous.

The idea of founding independent settlements and villages for tuberculous people took practical shape at any rate in book form in proposals for founding Garden Cities for the tuberculous. As early as 1913-1914, I. E. Esslemont in England called attention to the need for looking after the 100,000 tuberculous people, "who are still in an infective state, but are still fit for a certain amount of work."

The foundation of Garden Cities for the tuberculous is again recommended as the ideal in 1920 by M. Paterson in his *Shibboleths of Tuberculosis*. He opposes, however, every other colony scheme which develops in association with an institution. The Garden City project for tuberculous people has only once passed the stage of theoretical discussion.

In the last few years the idea of a *Cité Sanitaire* has called into being one of the greatest designs that has ever been realised for tuberculous people. The founder of the *Cité Sanitaire Clairvivre* in Dordogne—the General Secretary of the *Fédération Nationale des Blessés du Poumon*, Delsuc—has a vision of creating for tuberculous ex-soldiers who by law receive 100% pension, a community in which these pensioners can enjoy their health and occupy their time in useful work.

We shall examine minutely this extremely instructive example in connection with the discussion of the Papworth Scheme.

Institutional After-care.

Parallel to the efforts to create independent institutions for temporary or prolonged after-care there went the attempt to link up such institutions with the sanatoria.

Such experiments are of special importance in connection with the history of after-care, because they are the fore-runners of the modern schemes.

Eudowood Farm Colony, U.S.A.

One of the first schemes of a "Combined Institution" for the tuberculous, is known as the *Eudowood Farm Colony Sanatorium*. In the numerous publications in which the scheme has been described, sufficiently clear expression has not been given to the fact, that the founders had in mind the idea of an organic growth of centres of healing, which really constituted the after-care of cases which were not sufficiently stabilised to be placed in the category of arrested cases. They were, in fact, cases who, from time to time had renewed activity of the disease, but who easily became temporarily arrested. "In addition to the patients with arrested disease who may be given the advantage of a farm colony, there are many in whom the disease becomes quiescent, but not entirely arrested. We find that these are able to walk about the streets and public places of the city mingling with other people and who are in this way constituting a menace to the community. The sanatorium takes them and restores their "walking capacity", but does not close the lesions and render them non-contagious. The great need of further isolating these patients is obvious. Formerly, these patients were confined to their beds or to their rooms, and, hence, their probability of spreading contagion was limited. They cannot be kept in the sanatorium, because they are not clinically ill, but they should be housed in a place affording the sanatorium environment without institutional atmosphere. The ideal place is a colony, farm colony, if you will. Here these patients can be kept under observation and can be made comparatively happy and comfortable and can be maintained at a minimum cost to the state.

"We have made it a practice for the past ten years to send a number of these fibroid cases to our colony, where they have been able to enjoy life and do light chores around the house. Some of them have relapsed and have been transferred

back to the hospital for intensive treatment. Some have recovered again and have been returned to the farm. Others have remained at the hospital until the unfortunate end. Thus, in many instances, patients have been kept in our institution for as long as eight years before the final end came without ever returning to the city to act as a menace to public health."

"Our Farm Colony was affected materially by the war. Patients engaged there in some sort of reconstructional or vocational work were lured to the war industries by the high wages offered. Some of them earned as high as ten dollars a day and they could hardly be blamed for giving up their jobs on the farm. It is gratifying to know that most of them were able to do the work without relapsing. Our patient employment scheme, however, was so disorganised that it has not yet recovered." (M. F. Sloane 74).

The execution of this project was wrecked by the fact, that the farm colony was chosen as a form of sheltered employment, suitable for tuberculous people. Even at the height of its activities, only 20-30 colonists were accommodated. The disproportion between capital expenditure and the number of colonists as well as the strain on their physical capacity together with their inadequate earnings, were responsible for the failure of this pioneer experiment.

Rutland State Sanatorium, U.S.A.

Approximately at the same time in the Rutland State Sanatorium (Mass.) an organisation was created to demonstrate that "there was a partial if not entire solution to the after-care problem" (Crane 75). In the years 1904-1907, Bodwich tried to give employment to ex-patients who were not capable of pursuing a calling in the outside world. He employed them for 4½ hours a day in the sanatorium. These were housed in special Workers Quarters. For administrative reasons, these ex-patients, who were engaged in institutional work counted as self-supporting workers as soon as they were able to work four hours a day. This scheme gave an impetus to the establishment of an "industrial residential sanatorium," of an "agricultural and handicraft colony" in Rutland. Ex-patients of the four State Sanatoria, who were capable of two hours' work, were transferred there.

This first occupational sanatorium was built up on the principle of self-help. The weekly wage was on the average 12.04 dollars. The cost of maintenance came to 10-12 dollars. This occupational sanatorium was at work for only three years, till 1919. In 1919 a new experiment was undertaken. On the advice of the Advisory Committee of the National Tb. Association and with the help of the Federal Board of Vocational Education, in association with the New England Sanatorium—a middle class sanatorium—a Vocational School was founded, for admission, to which there were many applications. All the facilities were available for the foundation of a tuberculosis settlement, but unfortunately they were not utilised for this purpose (Crane).

In 1926 the New England Sanatorium was created, also at the same time plans were made for the establishment of an industrial colony in connection with the sanatorium, and this scheme we will consider later.

The Factory Sanatorium Scheme.

In England, on the instructions of the Medical Research Council, a memorandum was drawn up in 1915; it was signed among others by the eminent epidemiologist, Brownley (76). After a thorough study of the epidemiology of tuberculosis in a particularly severely affected industrial district, a proposal was submitted for a "modified form of sanatorium treatment," a scheme is worked out which

provides for the establishment of a boot and shoe factory in connection with the "ordinary form of sanatorium." The idea of a "factory sanatorium" is worked out in all its details, the necessity for first-class workshops, the gradual habituation up to eventual full employment and the building up of the business side of the question, are minutely discussed.

1915 is the birthday-year of the Papworth Scheme. In 1915 the Cambridge-shire Tuberculosis Colony was founded. In 1918 it was removed from Bourn to Papworth. In 1919 the Barlow Report on the rehabilitation of the tuberculous ex-service men gave a new impetus to the work of solving the after-care problem.

"The Interdepartmental Committee was greatly interested in and influenced by the evidence which they obtained from the sanatorium and settlement at Papworth . . . and part of the recommendation of the Committee to Parliament was that there should be the provision of, say, ten village settlements in various parts of the country with accommodation varying according to local requirements for probably 200 and 250 men and their families when necessary, each village settlement being in close connection and probably actually alongside existing sanatoria or training colonies" (First Report Employment Committee 77).

But only a small number of training colonies were founded and these were attached to sanatoria; these training colonies had as their sole object the provision of a "rapid training in a new occupation" for ex-servicemen after the completion of their sanatorium treatment. In a memorandum of the Ministry of Health, this conception is broadened: "The training colonies are to be considered as an extension of sanatorium treatment. These colonies should be a stimulant to the patient of the sanatorium making a stage on the road of recovery."

"These schemes on a scale never previously attempted were well organised, generously administered and efficiently staffed. Judged by the number of men who subsequently adopted the occupations in which they were trained, failure could scarcely be more complete." (Bardswell 78).

Summary.

This historical retrospect intensifies the impression that "the road of after-care is strewn with combatants and dreamers, with the disillusioned and the ship-wrecked" (Bochetti).

The problems were recognised, but the underlying principles were not stated and the methods by which a solution was attempted were inadequate. The Farm Colony, for example, was unable to guarantee to a sufficiently large number of persons with open tuberculosis suitable and economically satisfactory permanent sheltered employment. Then again, an attempt to create independent establishments for separate problems of after-care broke the continuity of treatment. In every attempt the reason for lack of success may be traced to insufficient treatment or to the provision of inadequate social economic factors.

CHAPTER 2.

Reorganisation of Institutional Care and After-Care.

The creation of a combined institutional and semi-institutional system of treatment and after-care has as its object the grouping of establishments which make it possible for the various grades of tuberculous patients to pass smoothly without discontinuity through the various phases of convalescence (medical and social). This may be accomplished either by creating a series of separate institutions for each of the various phases, connected with one another through a central organisation, or by building up multiple units, the various departments of which are adapted to the various stages of convalescence.

Such institutions are "as Caesar says of Gaul, *divisa in partes tres*." (Sir Humphry Rolleston (79) on the Papworth Scheme). This threefold organisation is not a casual phenomenon. It is a logical outcome of the study of the disease, and is to be found in every institution dealing in such a way with after-care.

The three parts of the whole unit are :

- (1) The Sanatorium-Hospital as centre for treatment.
- (2) The After-care section as intermediary between clinical treatment and re-employment in normal or sheltered industries.
- (3) The Village Settlement with industries for sheltered employment.

A *rehabilitation scheme* which also organises post-sanatorium life of the tuberculous is subject to economic and sociological laws which govern its growth and determine its character. These modern schemes are totalities and they grow from a small nucleus to a complete scheme of differentiated and balanced parts.

The centre of this growth may be the Sanatorium, the Training-Centre, or the Settlement. There are types where the Sanatorium predominates, and others where the Industrial Settlement is the real centre of growth.

If, for example, in a modern clinical sanatorium the idea of intensive therapy has been stressed, then the determining factor in development is the optimal utilisation of therapeutic means, the perfecting of medical treatment the stabilisation of such treatment and the prospect of rehabilitation in normal industrial life. An After-care Colony for *temporary* sheltered employment may be formed in connection with such an institution but the *permanent* maintenance of cases not responding to treatment is generally considered within their scope only as far as the industries need permanent employees.

The suburban tuberculosis hospitals of municipalities, however, have as their central policy not only the socio-therapeutic aim of improving the results of intensive treatment ; in addition, these suburban institutions must also meet the problem of segregating infectious cases. Thus the establishment of After-care Homes is part of their natural development. Hence after-care serves two purposes, institutional segregation and rehabilitation.

If, on the other hand, the main aim is the sociological one of insuring a livelihood to disabled ex-patients, the idea of the industrial settlement dominates the structure of the three-balanced scheme. Just as the clinical institution needs the temporary after-care department to consolidate the results of treatment, so an industrial settlement requires a "training-department" to select its stock of workers. Again the after-care department needs the support of a clinical section, which simultaneously serves as an admission section and provides optimal treatment to its inmates, being a filter which insures the first provisional differentiation of the cases. It also functions as the health centre of the village.

Thus the emphasis laid on the relative importance of the different sections varies according to the type of institution, which eventually develops. Two types of institutions result: *Para- and Post-sanatorial*, and *Village Settlement Schemes*.

CHAPTER 3.

Types of Departmental Institutions.

Sanatorial Schemes. The Biltoven Scheme.

The striving after the ideal of considerably raising the number of ultimate therapeutic results by temporary after-care and by a period of industrial convalescence respectively, is closely associated with the re-organisation of tuberculosis therapy. But an after-care section develops organically only when the institution is actually a "Centre de Traitement," which produces a steadily increasing number of *conditionally arrested cases*, for to obtain good *ultimate* results, it is essential that an after-care section be included in the plan of intensive treatment.

For this new conception of treatment, it is not sufficient merely to attach after-care departments to sanatoria; it requires a reform of the whole system in which the after-care department becomes a logical and necessary part of the scheme.

The reform of sanatoria, therefore, should not be attempted by merely adding after-care departments, but by transforming sanatoria into rehabilitation centres. Not every sanatorium is a "Centre de Traitement"; the majority of sanatoria are still sanatorium-hospitals with a relatively large proportion of cases for institutional segregation. Where the only purpose of after-care departments is to prolong the treatment without attaining the ultimate goal of rehabilitation, there would be much justification for criticism. "Ne cède-t-on pas trop au désir de compenser ou de réparer par une autre institution certaines insuffisances du traitement sanatorial. Nous croyons que dans cette question de l'assistance post-sanatoriale c'est maintenant le traitement sanatorial lui-même qui est en jeu." (Burnet 80).

The sanatorium *Berg en Bosch Biltoven* was built in 1932, to give effect to principles which in the course of ten years' preliminary experiment had been worked out in the old establishment of Berg en Bosch in Apeldoorn. Reconsideration of the principles of treatment led to its re-organisation.

No special method of treatment is involved, but there is a co-ordination of all methods of treatment, the exclusion of all purposeless routine, the most intense concentration on each case and a clinical organisation of the highest efficiency.

The period of treatment is not arbitrarily limited or lengthened, but is adapted to each individual case and when this seems advisable may last a year or even longer.

While in many sanatoria to-day, treatment by absolute rest has become a purposeless routine, at Berg en Bosch it is used only with precise indication. The patients are admitted to the clinical department, and subjected to a strict medical observation. As soon as his condition permits, the patient is removed to another ward, in which rigid medical treatment in the open air is continued until all active manifestations of the disease have disappeared. Then follows the transition to the third stage, in which the *working cure* begins. This is designed as a probationary period which either leads the patient on to his discharge into normal vocational life, or, if stabilisation has not been reached, to the after-care colony.

In the building of Berg en Bosch, the Bilthoven-Scheme has, for the first time, found an adequate expression.

The bed-section consists of wards only; the open-air resting-section of large open rest-verandahs, without a common room but with bath rooms; the occupational therapy section consists of dormitories with day-rooms and facilities for rest. These three sections are arranged separately in one wing for men and in another for women.

In the after-care colony a special form has been selected, which gives the patients the feeling of self-reliance and independence.

The *motive* of the industrial organisation is this: occupational therapy which does not pay commercially creates no productive work in the strict sense of social economics and therefore is unlikely to give the worker satisfaction. The after-care colony is the community of ex-patients of the Sanatorium who are not yet fitted for discharge. Of these ex-patients, the men are housed in shelters in accordance with the Papworth Scheme, the women in a hostel. The maintenance costs of an ex-patient in the after-care colony amount to two thirds of the cost of a patient in the sanatorium section.

The rooms of the workshops of the after-care colony have been fitted up with due regard to modern factory hygiene and by the employment of up to date machinery. The undertaking is intended to give congenial and productive work to as many untrained workers as possible. In such work although the machine is found to be indispensable, it is of value when a person has to work well, comfortably and fast, and most particularly when with its aid work, which would otherwise be too heavy for the single craftsman, is thereby lightened.

In consideration of the fact that the workers who are occupied in the workshops are still undergoing treatment and are only to a certain extent stabilised ex-patients, the standard which is fixed for the economic efficiency of the undertaking is somewhat different from that for sheltered industries with a selected staff of stabilised workers. In this colony for temporary after-care, sheltered employment is undertaken for the restoration of capacity for work in the social sense, and it cannot therefore be profit-making. Financial support in the form of grants and capital loans without interest is therefore entirely justified in these cases. The workers are occupied in the undertakings, according to their capacity for work and according to their need for treatment. Patients receiving sheltered employment are not fully paid but receive an allowance based on the hours of work and the output of the workshop.

The industry, however, is an industrial enterprise which is organised as far as possible, on strictly commercial principles. To employ substandard labour without any previous selection and without any regard to its actual value makes it necessary to procure financial assistance for this substandard labour. Moreover, only small wages are paid to these patients undergoing occupational cure.

A highly skilled trade as *e.g.*, the Ado-workshop for toys or the book-binding establishment specialised for artistic bindings, requires foremen. When these are recruited from ex-patients the socio-medical need for a permanent sheltered employment for the refractory after-care cases is thereby met.

Permanent sheltered employment is given to individual foremen—keymen—who are paid full wages, who live with their families in the neighbourhood of the institution. These men look after and instruct persons who may not require permanent sheltered employment, but who would benefit from such conditions of employment for some months or even years.

The technical difficulties of attaching such after-care institutions to an existing sanatorium, must not be under-estimated. After-care institutions are specially needed where therapy has attained a high standing. But eminent clinical practitioners are too often uninterested in problems of social medicine. Moreover, the number of conditionally arrested cases among the ex-patients of an ordinary sanatorium requiring temporary after-care is often too small to justify the establishment of an industrial undertaking for their particular benefit.

It is often easier to create a new institution than to join it to one already existing, although on principle, an after-care establishment is justified only if it grows of necessity out of a sanatorium. It requires special organisation and special comprehension to ban the institutional atmosphere from an after-care department attached to a sanatorium, a difficulty which may be less acute in a separate after-care institution.

"Opinions are divided, whether the working post-cure shall represent a regular constituent of the cure at a sanatorium, or whether special sanatoria shall be built for this purpose . . . But it is essential that post-sanatoria for rehabilitation shall have at their disposal a complete therapeutic equipment. For unforeseen changes . . . require the immediate return to the sanatorium, without change of place, even if only for a few days. Moreover, the transition by steps from rest to work, which is so important, demands an extremely careful rationing of the expenditure of strength and a strict supervision, which can be carried out only in a healing centre which is well appointed and equipped for all eventualities" (Vos 81).

There are three experiments: Zonnestraal (Holland), Pott's Memorial Hospital (U.S.A.), and Appisberg-Männedorf, Switzerland. They have been so organised, that while they agree in principle, they nevertheless, each have their own individual characteristics.

Zonnestraal, Holland (82).

Zonnestraal (Holland) was founded in 1926 by a Committee, who had in view the establishment of industrial colonies for tuberculous workers as a supplement to the ordinary sanatorium treatment of giving to patients from different sanatoria likely to benefit therefrom a period of sheltered employment before they return to ordinary industrial life.

The scheme was fully planned for this purpose. From the beginning a number of workshops were built by the patients themselves. The story of Zonnestraal is an example of the gradual adaptation of a plan of organisation, based on theory, and put into practice.

It very soon became apparent that the transference of "ideal" Zonnestraal patients from other sanatoria was not taking place as expected. "Patients who had first been in other sanatoria, and therefore had received treatment previously," seldom came. "The transference of patients from other sanatoria, which took place on a very small scale if at all, can safely be described as non-existent. The patients whom Zonnestraal now admits have for the most part received no previous treatment." Here too, experience has confirmed the view that a pre-selection of patients according to presumable suitability is inexpedient.

Although attempts are continually being made, to bring about an exchange of patients with other sanatoria, it is the rule to-day, that Zonnestraal, like every other sanatorium, admits patients direct for treatment, and there are a great number of tuberculous people who prefer Zonnestraal to any ordinary sanatorium. Zonnestraal has adapted itself to actual needs, and on the one hand has established a clinical section, in which the usual form of sanatorium treatment is carried out and on the other hand it has developed the foundation of the "working colony."

The after-care Colony is housed in shelters and hostels. In this section after-care patients whose efficiency is about 60% are received. They must have previously spent at least two months in the clinical section.

The after-care patients form a community of their own. There is no absolute division between them and the other patients (common dining- and work-rooms), but there is an "administrative and social" distinction. The after-care patients have somewhat greater freedom, and are under less strict medical supervision.

While the *working cure* in the case of the sanatorium patients, just as in the Bilthoven Scheme, is only a phase of the treatment and payment is not given for it, paid work in the case of the after-care patients is already a means of existence. The after-care patients are paid wages. Fifteen per cent of the wage is made over to a guarantee-fund, from which deficiencies in wages in the case of transitory illnesses (less than eight days) are paid. The remainder is credited to the authority, which has sent in the patient, so that the bearer of the expense has to pay the difference only.

Such long periods of sheltered employment are contemplated, that the practice of settling the families of the patients has been more and more adopted.

"The institution of after-care for patients has followed from the realisation, that if a person is employed in industry, little less and perhaps rather more than 100% efficiency is demanded. Instead of sending patients back to normal industrial life with a "validity" of more than 60%, but unable to keep pace with the speed demanded by industry with all the risk connected with this, Zonnestraal offers treatment, nursing and work, in short, a livable life." (van Lier).

Seven families have been accommodated in the neighbourhood. Funds have been collected to build two houses on the estate.

This small group of after-care patients, whose temporary sheltered employment almost passes over into permanent sheltered employment receives full wages, with but a trifling deduction for medical attendance. When greater claims for medical treatment are made, the native parish has to meet the costs. Since, a removal of the patient and his family back to the native parish necessitates maintenance by the parish, the parish has hitherto preferred to make the contribution to the institution.

The workshops and industries in Zonnestraal have developed so satisfactorily that they can support such an after-care scheme.

Of the five workshops planned, so far three have been built and are in use. Reference has already been made to the work for the diamond industry. A new and profitable opening seems to be the making of tools for leatherwork and shoe-making. Here, too, success depends on new inventions. A large space is taken up by machine-carpentry, a smaller one by the building of boats and the manufacture of bicycles. In all, provision has been made for different industries.

We gain the impression in the first place that Zonnestraal although planned as a "Post-sanatorium" has modelled itself almost entirely on the Bilthoven Scheme. Actually the routine of the treatment and the development of a departmental character show parallel development but the two institutions retain their individuality.

Pott's Memorial Hospital. U.S.A.

The idea that temporary after-care should be limited to a group of conditionally arrested cases, finds expression in the conditions of admission to the Pott's Memorial Hospital in the State of New York. "The ideal case" is the patient with "minimal or moderately advanced tuberculosis," who is passed on from a sanatorium, a clinic or a specialist after a sufficient period of treatment. "Patients shall have no constitutional symptoms, the sputum, if any, shall be negative for tubercle bacilli on

repeated monthly examination. Roentgenograms shall demonstrate good healing of the pulmonary lesion with complete obliteration of cavity, if previously present. The patient shall have no serious complication. These conditions have existed for a period of three months, during which the patient has been taking one hour's walking exercise twice daily, or its equivalent" (Pattison).

The experience of Pott's Memorial has shown that it is not necessary to limit ourselves so categorically to the "ideal case," or to rely on the judgment of sanatoria sending patients, even when the judgment of the sanatorium physicians is based on experience of occupational therapy.

"In the beginning it was the fault of the medical board that the opinion of the sanatorium physician as to the working capacity of his patients should be accepted, and this dictum was followed for a time. It was found to be an unwise procedure. There was no known method of determining how much the individual tuberculous patient coming from sanatorium could do if assigned to regular work. Most of them had been given only walking exercise or limited occupational therapy in the form of leatherwork, basketry and so on."

The experience of ten years has shown that a strict preliminary selection on the principles of the ideal case does not do justice to the numerous borderline cases which do not strictly answer to these demands.

For this reason a new principle has been introduced. As opposed to the earlier policy which provided exclusively for the admission of non-infectious cases, a certain number of sputum positive cases are also admitted on the recommendation of the Survey Committee. "Admission of certain sputum positive cases is recommended." Every patient is subjected to an observation period of four weeks, and only at the end of this observation period is it decided whether the patient gains admission as a resident worker. In the case of activity he is discharged. This preliminary period of four weeks is thus a concentrated clinical control of all functions. The minimum duration of the stay is four months. It is desirable "that patients shall remain until they are pronounced apparently fully rehabilitated."

In other points, too, the ten years' report of the Survey Committee foresees a widening of the original sphere of the institution's work. The character of the institution is maintained as that of an institution for "rehabilitation of the tuberculous and the restoration to normal industrial and home life" but it is recognised that a limited number, about 10-15% need a stay of practically unrestricted duration.

The development of a colony for the permanent settlement of a large number of tuberculous persons with their families is not recommended. Pott's Memorial is equally far from being a vocational school which teaches definite callings. On the other hand, as before, the aim is a general raising of the standard of education. (Points 5-8 of the Five Years' Survey Committee's recommendation).

To cope with the increased demands for admission in the coming years, an extension of the existing industries and the creation of new ones is recommended.

Summary of the Survey Committee's Recommendation.

- (1) Restoration to normal industrial and home life should continue to be the purpose of the institution.
- (2) The bed capacity should be doubled as quickly as possible.
- (3) Limited additional residential facilities should be added for those who should remain a long time.
- (4) Present policy of offering some useful educational service is approved.
- (5) A vocational and educational counsellor is recommended.
- (6) Aptitude tests are recommended.

- (7) Continuance of research work within budget's possibilities is recommended.
- (8) Admission of certain sputum positive cases is recommended.
- (9) Greater publicity among sanatoria is urged.
- (10) Additional industrial and diversional activities should be offered.
- (11) The use of the farm properties' produce, poultry and dairy products to meet the needs of the institution should be continued.

Thus, there is no longer to be strict adherence to a theoretical preliminary selection of the "ideal case," nor any limitation of the post-cure to weeks and months.

On the contrary, the object of complete rehabilitation is to be pursued even though in the case of some persons, this can be attained only through permanent sheltered employment.

A "follow-up study" of 218 patients, who have been in Pott's Memorial Hospital longer than four months, proves that the assessment of working capacity on discharge has been correctly made. For 109 patients discharged in 1926-30, 70% were rehabilitated. The corresponding figure for the period, 1930-35 was 80%.

The follow-up results in 1936, showed that for the first group 57.8% and for the second group 75.2% were well and working.

Of 43 cavity-cases (in ten years) there were discharged as rehabilitated 37.2%; their follow-up in 1936 showed 41.8% to be well or working.

The rigid rules of selection did not exclude those who were really in need of admission. The fact that with the 266 admissions, which were passed in as "ideal cases," the average duration of stay was one year two months and seven days, supports the view that this danger has been avoided.

The needs of some patients and the development of the industry, had led to the retention of a number of "key persons" for as long as eight years as a kind of "permanent resident workers," although for financial reasons, the number of permanent settlers had to be strictly limited and the development of a Village Settlement, or Colony does not yet seem advisable.

Pott's Memorial Hospital was founded in Livingstone, New York, in 1926 by a bequest. H. E. Pattison was the Executive Officer of the Foundation Committee and the Medical Director from the time of foundation.

In the plans, everything which might bring to mind the appearance of a sanatorium or a hospital was avoided. After a preliminary survey of possible industries, a printing workshop was set up, before this a farming industry had been organised and a beginning made with the manufacture of carpets and rugs from woollen yarn. The establishment had 50 beds.

The printing works were established in 1927 and found a "self-sustaining" basis until the economic crisis of 1929. "Since that time, the shop has operated with considerable loss annually, but has afforded employment for 5-15 patients, depending upon the amount and kind of work in process." In all, 115 men and 52 women have worked in the printing business, many of them for several years. A skilled worker receives 97 cts., a "semi-skilled" worker 35-50 cts. and an unskilled one, 25 cts. per hour. The turnover amounts to 18,000-22,000 dollars a year.

When an unskilled worker receives instruction, half his wage is retained to cover the cost. During the period of the four weeks' course, wages are not paid. If the patients are sent in by the authorities, a maintenance allowance of 15 dollars per week is charged. Earnings are credited to the authorities up to a disbursement

of pocket-money of 1.5-2 dollars a week. In the case of other patients, who are not sent in by the authorities, earnings up to seven dollars are taken to cover expenses, and in addition, seven dollars must be paid from private sources or by social agencies. The remainder of the expenses is taken from the endowment fund.

Those who are not employed in the printing shop are occupied in the work of the institution and on the farm, in the garden and on the poultry farm.

"The first ten years' period may be fairly looked upon as experimental and tentative." But we may conclude that:

The experiment is regarded as successful and profiting by the experience gained it is being continued and extended. The costs have been up to the present extremely high, because the expensive equipment has served comparatively few persons. The doubling of the number of beds, which has now been decided on, will lead to reduction in the costs per person.

Appisberg-Männedorf, Switzerland.

The Training Centre of Appisberg-Männedorf (84), Zürich (Switzerland), was brought into existence in 1932 by E. Bachmann. The conditions for the establishment of a central training section adapted for the transference of suitable patients from other sanatoria are particularly favourable. The Training Centre is the property of the Zürich Anti-Tuberculosis League. The Canton of Zürich with 600,000 inhabitants has, in addition to a number of tuberculosis sections in general hospitals, two cantonal sanatoria in the Hochgebirge with a total of 400 beds. The associated Training Centre, is outside the gates of Zürich, 15 km. away and at a height of 520 m. The President of the League, which manages the Training Centre, is also Vice-President of the Administration of the Cantonal Sanatoria. In this way an organic unit has been created, all the more complete since the dispensaries also are supplied and managed by the League. The Training Centre is thus incorporated in a cantonal anti-tuberculosis scheme.

Although in this way a certain co-operation is secured, it has become gradually apparent that a sanatorium section with up-to-date equipment is necessary to serve as wards for new admittances and for relapsed cases. Of the 132 inmates in 1935, 55 were sputum-negative and 77 sputum-positive. There were 21 cases of unilateral pneumothorax and six with double pneumothorax. Only 18 were in the first stage, ten in the second and 104 in the third. . . . Through the extension of collapse-therapy and the increasing treatment of severe cases by collapse-therapy in the Swiss Cantonal Sanatoria, 30% are only in the first stage, 70% in the second and third stages.

"The result is that the Training Centre, as the intermediate member between sanatorium and normal life, is overburdened with advanced cases." Intensified stress is therefore laid on a more rigorous selection.

Appisberg, as is its intention, is an institution for transitory after-care. The average length of stay was 165 days (98 days for first stages, 186 for third stages). By means of lectures in the sanatoria and by other methods of instruction steps are being taken to ensure that the aims of the training centres may become well-known not only among doctors, but also among patients. Here as in the case of Pott's Memorial, propaganda is carried into the sanatoria, for without the active co-operation of the patients a training centre cannot exist. In order to get the right patients Appisberg has had direct recourse to various dispensaries; this has been possible as the physician in control (Marti) is at the same time a tuberculosis officer in the town and Canton of Zürich.

No attempt to deal with the question of permanent employment on a larger scale has yet been made, because this does not correspond with the actual intention of the institution, and because "disabled men can be taken into a permanent employment only in accordance with the needs of man power of the industry." The industry is certainly a rationalised workshop-concern, but it cannot yet employ a larger number of settlers. Some positions in the industry and in the management are occupied by permanent settlers.

The institutional segregation of the open-labile cases is also outside the real sphere of the tasks of Appisberg. For this purpose it seems suitable to exercise a policy of decentralisation, and to attach to a tuberculosis hospital "workshops for permanent invalids with limited capacity for work and for whom work makes life worth living."

Appisberg has been built with a capital of 850,000 Swiss francs. It consists of a central building with rooms for medical and administrative purposes, a large workshop for woodwork, and a hospital section for 16-20 clinical patients.

On each side of this main building, and connected by rest-halls, there are four hostels with about 20 beds each. Every room contains two beds.

The charge for institutional care is from 4 to 4.50 francs per day, and is therefore one-third less than that of the charge of sanatoria for institutional care. It is met by the insurance authority, workmen's sick fund, welfare centre and in part by the patient himself. The actual cost is about 1 franc higher per head per day, but here the interest on capital and the maintenance of the workshops are included.

According to the legal decrees of the tuberculosis law, the League pays 10% of the maintenance costs. The difference is covered by the Canton of Zürich.

The patients receive no recompense for the first 100 hours of work; later they receive 20 cents per hour, either paid in cash on their discharge, or at their wish the amount may be used to purchase clothing and linen prepared for them in the workshops. In accordance with the character of the institution, there is at the moment no reason to develop the industries in such a way that high wages could be paid.

For this reason, Appisberg confines itself to wholesale industry, which while it has a steady market, is poorly paid for the goods it manufactures.

The work in the workshops is organised on a mass production principle and is conducted on commercial lines. The goods are sold in the open market, and are delivered principally to a few large stores in Zürich. In this way a large body of unskilled working power with small revenue can be profitably employed in the undertaking. The main products are the production of simple kitchen furniture, ladders and other wholesale wares in considerable quantity.

In 1935 39,000 hours were worked by the patients—3,200 hours by the foremen. The turnover amounted to 40,000 francs. The wages portion was 7,000 francs. The undertaking is fully self-supporting.

These figures are calculated and are based upon a commercial card index system. Every worker is given daily a work-ticket with number of hours, etc., so that costs can be reckoned. As calculation has shown, such an undertaking can assume a profitable form only when the men adapt themselves to mass production. During the spring and summer, a large space is taken up by the horticultural industry, which dispatches a regular supply to hospitals and temperance hotels.

These three post-sanatoria have definite characteristics in common and encounter similar difficulties.

They are all in course of development, they have all in outline the threefold organisation, and their emphasis lies in the socio-therapeutic function of consolidating healing by temporary after-care and facilitating transition to normal vocational life.

The obstacles which they have to overcome are also similar: they are directed to recruit their patients from other sanatoria, and it is natural that the sanatorium doctors will themselves wish to complete the clinical stabilisation in which they are interested, and will prefer to send only those patients for whom they can do nothing further.

The post-sanatoria have, it is true, a destiny in the sphere of social therapeutics, but they concentrate on sociological and economic forms of organisation and in this way naturally assume a character which attracts especially the chronic tuberculous who is not employable in normal industry. They labour under the difficulty that they are designed for rehabilitation in normal industrial life, but are in danger of being forced by their material to forsake their proper goal.

The best evidence of the strength of the latent forces which compel the evolution in such training centres has already been afforded by the evolution of the Training Colony of Hairmyres into a departmental institution, a sanatorium hospital—with an after-care department.

Sanatoria with after-care colonies and certainly post-sanatoria contain the same elements. It is evident that from two quite different starting points institutions develop in plan and in activities until they come to possess great similarities.

So long as such institutions are in a state of development, it cannot be foretold which factor, whether of medical therapeutics, or social hygiene or sociology, will ultimately predominate.

Herrnprotsch Scheme (Germany).

In all countries during the last few years a new type of institution has developed, which we may designate as a suburban Tuberculosis Sanatorium-Hospital. These institutions were created by large municipalities in order to take the tuberculous out of the general hospitals and so provide a central institution in which organised special treatment and simultaneously hospitalisation and institutional segregation is undertaken. This provides accommodation for all those tuberculous persons who cannot be admitted to sanatoria.

In 1920 when the wave of tuberculosis was again rising, the municipality of Breslau, decided to use as a tuberculosis hospital two new hospital buildings of 150 beds each, situated on the outskirts of the town. The institution was fitted with all the means necessary (X-Ray and Research Laboratories, etc.) to guarantee an optimal clinical standard; as early as 1922 a separate department for thoracic surgery was set up. Nevertheless, in the years 1920-25 the institution was predominantly an institution for hospitalisation. The number of patients who could profit by this treatment was relatively small; up to 1925 scarcely 10% of those who passed through the institution were pneumothorax cases. On the other hand, institutional segregation proved unattainable, because, as the 1925 statistics showed, the overwhelming majority of the chronic open tuberculous cases refused to remain in the institution for longer than six months, although practically every endeavour was made to keep them there permanently.

While the Bilthoven Scheme concentrates essentially on the conditionally arrested cases, there was necessarily in the Herrnprotsch Scheme a concentration on the cases refractory to treatment. While at Bilthoven one of the criteria for a patient's transfer to the after-care department was the disappearance of the bacilli

from the sputum, at Herrnpotsch the reverse was the case, for transference to the after-care department meant positive evidence of tuberculosis by the presence of bacilli in the sputum.

The after-care department at Herrnpotsch was thus essentially a home for the chronically infectious tuberculous, and only in the second place an after-care section for conditionally arrested cases, although with the passage of time the dominating idea became increasingly to provide possibilities for carrying out a curative process of indefinite duration.

It is a special characteristic of the Herrnpotsch Scheme, that while the municipality administers the central institution the associated after-care settlement is managed by the Local Association for Prevention of Tuberculosis. This association which is under municipal direction and is financed mainly out of public funds (Province, Town, Insurance) is entrusted with the organisation of the fight against tuberculosis and the dispensaries also are under its care.

In 1927 an after-care settlement for 32 families and two hostels accommodating approximately 40 single persons was set up on the estate of Herrnpotsch institution 100 yards distant from the hospital buildings. The settlement was of course an independent unit, but was looked after by the medical and administrative staff of the Tuberculosis Hospital. In this way the appearance of a non-institutional "colony" was guaranteed and a greater flexibility secured, without the homogeneity of the two undertakings being in any way disturbed. (85).

The after-care colony was in fact a semi-institutional organisation; the inmates were really maintained entirely by public assistance and the Insurance Committee paid the usual rates for institutional segregation during their stay in the settlement. The allowance from the municipality, was paid in cash, so that the principle of responsibility of the settler might be emphasised. By this arrangement the settlers preserved the right to spend their money as they thought best.

These means, however, were sufficient to guarantee no more than a very low standard of living. The general costs of living were higher in the settlement than in the former environment. Without some incentive it would not have been possible to induce the sufferers to prefer life in the settlement to life in the town. For this reason alone an industrial undertaking must be organised to meet the need, not only of providing work but also of providing remuneration.

While as a rule the recipients of municipal relief, have their earnings deducted on payment of the allowance, in the case of inmates of the settlement an exception was made, that within certain limits the money received for work done remained untouched. As the general economic crisis developed, this limit was steadily lowered, so that eventually only pocket-money was left. This regulation held good for those cases of an infective nature, provided they had a certain chance of survival and a residuum of employable working power, for as long as they remained in a state of infectivity.

The cost of housing and maintaining the unmarried cases in the settlement, inclusive of paying interest on the capital and of financing the workshops, was about two-thirds of the maintenance costs in the hospital.

In this way it was possible to maintain complete institutional segregation with the free consent both of the patients and of their families, without the expenditure of public funds becoming unreasonably high. Despite the reduction of pocket-money, none of the settlers has voluntarily left the settlement in the period of nearly ten years since its establishment, since they learnt that life in this settlement was the solution of the problem of their existence. (86).

It soon became evident that there was a further problem, i.e., to make the after-care settlement available for the ever-increasing number of conditionally arrested cases. When the settlement was first established there was some financial difficulty in the way of transferring such $+$ — cases to the settlement, as the Insurance Authorities did not undertake the payment for institutional segregation as of course they did not regard a $+$ — case, in which the sputum had remained negative for three months, as one in need of segregation. For these cases it was essential to make fuller use of their earning capacity by providing more work.

The results achieved with these conditionally arrested cases were just as convincing as with the institutional segregation cases. These patients, who on discharge from the hospital were still insufficiently stabilised, became in the course of years so adequately stabilised that 30% of the total number of settlers could be discharged as fully stabilised $+$ — cases. These were mainly cases transferred from the Sanatorium Section with incomplete pneumothorax result, phrenic evulsion, pneumothorax exudates, reactivation of the other side, cases treated with thoracoplasty, etc. The settlement was an invaluable means of carrying out an intensive collapse therapy in difficult cases, and experience has shown what an advantage it is for the sufferer if the physician can quietly await the optimal moment for intervention, and is not prematurely forced to a decision by the financial straits of the patient or the pressure of the authorities (Brieger 87).

To sum up: For the groups of unmarried $++$ and $+$ — cases, provision has been made to fulfil at moderate expense the socio-medical and socio-hygienic tasks which present themselves in the administration of a tuberculosis hospital. These services are paid for by the responsible authorities and the expense is not greater than that incurred by other and less effective forms of maintaining the tuberculous, since it secures the active co-operation of the patients, and guarantees them a mode of living which compensates them for their efforts at self-support.

The colonisation of tuberculous persons with their families requires an efficient industry. The building up of the industry at Herrnpotsch has proceeded according to the principles which have been described as of universal application. Unfortunately the economic crisis severely restricted the development of the undertaking. For this reason the unmarried ex-patients of the hospital were given more and more preference for admission into the settlement.

Various attempts.

In many countries different experiments were made in the organisation of after-care departments attached to the sanatoria.

Wrenbury Hall Colony.

The Cheshire Joint Sanatorium (England), whose clinical work has been adapted for intensive treatment, has also organised a small after-care colony, on which report is made in the reports of the Employment committee. Wrenbury Hall Colony has up to the present 15 colonists in cottages and 65 patients in hostels. The industries have a turnover of £4,218 (1934). The main industries are Poultry Farming and Carpentry.

Cottage-Scheme.

A Cottage Scheme has been instituted in some of the sanatoria of Wales (England). In the grounds of some sanatoria cottages have been established, in which the women patients, during the last weeks and months before their discharge, live in small household communities. These (ex-patients) are instructed in branches of housework, and so on. This Cottage Scheme, which has existed for some little

time, effectively takes the group of convalescents away from the hospital atmosphere and readapts them for normal life. (88)

In the tuberculosis hospital of Fazakerly near Liverpool the experiment of establishing homes for tuberculosis ex-patients has been made.

Olive View Sanatorium Camp, U.S.A.

In the U.S.A. the Convalescent Camp of the *Olive View Sanatorium* (California) and the *Central New England Sanatorium Scheme* of Rutland, Mass. deserve mention as *After-Care institutions*.

The Olive View Sanatorium is a large central sanatorium with about 900 patients. Two Camps (one for men and one for women) are "associated with the sanatorium under the supervision of the same Medical Director." These camps are not designated for vocational training, but "to apply principles of graduated work though training is given." The two camps are very simply arranged. They are Block Houses (Hostels) which are disposed around an inner court, for 54 ex-patients. Only quiescent and arrested cases are admitted whose "working capacity is that they should be able to work for two hours a day."

The patients are occupied with tasks in the camp and receive as remuneration for two hours' work a day free board and lodging, and can earn a little pocket-money as well. The costs of maintenance come to only 50 cents a head per day.

When opportunity offers, patients are also taken over into permanent positions the majority are discharged after they have shown themselves to be stabilised. This Camp was established in 1926. There are no workshops in which industries are carried on, but there is a plan afoot to establish "a Rehabilitation Colony for men and women suffering from chronic tuberculosis." (89)

*Central New England Scheme, U.S.A.**

The Central New England Scheme "can be typed as a post-sanatorium enterprise" (Pattison). The present-day organisation is the last of the many forms which were tried in the course of years. The institution (a middle-class sanatorium) is to-day intended for sanatorium treatment "and especially for after-care (rehabilitation)." It consists of a sanatorium of 100 beds and of an "industrial colony for 75 unmarried colonists and six families, who work partly in the carrying on of the Institution in workshops.

Sanatorium and Colony are under the direction of B. Crane. The average duration of the period of treatment is nine months. The patients are divided into:

- (a) Sanatorium patients until able to do two hours' daily work.
- (b) Working patients beyond two hours' daily work.

Two-thirds of the patients are working patients. They are recruited not only from the section of their own sanatorium, but also from other sanatoria of the State.

The working patients have the status of full workers, they receive wages according to the time worked and according to efficiency; these wages are paid in cash.

These patients pay for their board and lodging 7.1 dollars per week (according to circumstances and earning of patients). The maintenance costs amount to 7.5 dollars a head per week.

Temporary and permanent sheltered employment are guaranteed "both, up to rehabilitation to eight hours a day."

*This asterisk means that the information on which descriptions are based have been obtained by means of a questionnaire sent by the Committee.

The work is in the main work in connection with the institution, but work is also done in industrial workshops (Wood working).

As is seen from the Memorandum of the National Association against Tuberculosis, there is in U.S.A. no inclination to promote industrial activity in Sanatoria. Temporary sheltered employment on the staff of sanatoria is preferred. "The suggested rehabilitation programme for sanatorium patients whose prognosis indicates that they may hope eventually to become self-supporting" provides:

"A social analysis of the patient, an educational programme in co-operation with the official educational and rehabilitation groups in the State and temporary employment on the staff of a sanatorium." (Burhoe.)

*Sanatorium Magnanville, France.**

In France, too, the industrial after-care colony has hitherto found few friends. The plan of the Director of the Sanatorium of Magnanville (Seine et Oise), which was established by the Association Leopold Bellan in 1934, has been only partly carried through. "Le sanatorium avait d'abord été conçu comme la première étape de réalisation d'un grand village sanatorium au voisinage de Paris, village, qui aurait constitué une oeuvre complète de rééducation et de post cure. Sans être abandonné ce projet s'est heurté à des difficultés matérielles qui n'en pas permis jusqu'ici la réalisation. Toute fois le sanatorium est demeuré attaché à l'idée première qui avait inspiré sa création: la rééducation du tuberculeux dès la période sanatoriale."

Of four projected workshops, up to now only one has been operating. A sewing and knitting workroom, where embroidery and hemstitching is done with machines, has specialised in linen goods, such as shirts, pyjamas and indeed articles of many kinds made of linen. The orders come for the most part from Parisian stores. The workwomen are paid according to what they achieve (number of hours and work accomplished). 4,000 articles were delivered in 1935.

Up to the present time the institution has 310 beds half of which are occupied by unmarried persons; the average duration of treatment is 14 months. Further development, it is stressed, will lie in the re-education of the ex-patient. Permanent employment is not the end in view. An attempt will be made to create with the help of welfare centres an employment agency.

*Sanatorium Du Vion, France.**

Boissel in Lyon has produced evidence that, independently of national character, economic position and so on, the tuberculous subject is very ready to undergo segregation even in an institution, provided the method of institutional segregation guarantees him advantages or offers a solution of his economic, psychological and physical needs. Boissel in his newly built Sanatorium has provided the essential conditions for a protracted stay; the most modern architecture, highly developed clinical organisation and sheltered employment.

*Zonlichtheide, Holland.**

In Holland, after-care institutions of an industrial and artistic character are preferred. A model after-care home is attached to the Sanatorium Zonlichtheide Maria Oordt Gennep. Modern architecture has been chosen, as this deliberately combats and excludes any sanatorium atmosphere. The centre of its industrial activity is a handicraft workshop, which aims at producing first-class articles in all varieties of handicraft and satisfactory market has been secured.

The undertaking is still relatively small and confined to patients of the middle class. A few houses have been built, to afford sheltered employment for a prolonged period to married patients and their families.

*Peamount Sanatorium Industrial Colony, Ireland.**

The Peamount Sanatorium in Ireland, Newcastle, Co. Dublin, founded in 1911 as a central Sanatorium for 12 counties under the State Insurance Act, requested Varrier-Jones to organise an undertaking after the pattern of the Papworth Scheme; it was led to this step by the inadequacy of sanatorium results. "Peamount Village Settlement is perhaps the best example extant of an ordinary tuberculosis Sanatorium which has successfully adopted the Papworth Scheme." After the pattern of Papworth, there were first erected some Hostels for men and women and a workshop with eight patients as initial staff. Within a year the number of those employed rose to 40 and the turnover to £3,555. Additional shelters for the workers, hostels for the female workers, workshops and new buildings were provided (1930). Within two years the orders for "portable buildings" had increased so much that a modern workshop with "up-to-date wood working machinery" was set up. The number of working patients rose to 88, of whom 14 were "permanent settlers." In the same year, 1932, glove-making was taken up as work for the women. This enterprise was such a success that in 1934 a modern glove-factory was built by the patients. In this year 100 patients were at work, among them 40 girls in the glove factory. In 1935 the first two girl-settlers were accommodated. The turnover has risen rapidly and steadily since 1930. The total turnover up to 1936 came to £63,818, the sum of wages paid out to £24,036. In 1936, £4,573 were paid out in wages, full wages to 16 settlers and pocket-money to about 80 patients. The increase in business is so extraordinary that the Carpentry Department's orders for portable buildings and glasshouses runs into four figures, and every glove made in 1936 was sold in advance; it is clear that under such conditions the turnover might easily be doubled.

Peamount Industries have become an efficient industrial concern under the direction of an experienced manager, himself an ex-patient of Papworth, with which he remains constantly in touch, and he has shown that commercial insight which is so necessary in building up new industries. Peamount Industries works with substandard workers, passed on from Peamount Sanatorium and housed in hostels and shelters. Up to the present only a few foremen have been installed in permanent posts.

In the original plan of the Peamount Scheme, provision was made for developing the industry so that it should become the foundation of a workers' settlement. Thus, the Peamount Scheme, according to its planning, was intended to fulfil the sociological task of after-care for tuberculous people. So far, the construction of the third part of the threefold Papworth Scheme, has been only partially effected. The village housing scheme has been begun but has not developed rapidly on account of lack of funds.

Peamount in its present phase of its development is still in the making. All the will power is there; and the logical development of the scheme is assured as soon as the necessary cash is available.

*After-care Scheme, Military Sanatorium Montana, Switzerland.**

An interesting individual experiment has been made in Switzerland by Voute, Director of the Military Sanatorium of Montana of the Federal Military Insurance. It is an Institution of 80 beds with about 170-180 admissions and discharges in the year. "Annually some six to ten patients, whose tuberculosis remained infectious,

were discharged; they were admittedly to a certain extent stabilised and capable of earning, but they were practically unable to use their earning power and their institutional segregation was absolutely essential for precautionary reasons."

Since, in the absence of any appropriate organisation and arrangement, there was no possibility of suitably accommodating these patients after their discharge, the sanatorium was re-organised so that three categories of patients can be distinguished, who are cared for in three sections: 1. The Hospital Section. 2. The Working Cure Section. 3. The After-care Section.

In the Hospital Section clinical treatment is carried on and occasionally employment is allowed. In the Sanatorium Section systematic work begins in conjunction with treatment. The time worked is increased from two to six hours a day. The patients work in workshops producing goods required by the institution, and in an extensive agricultural farm industry (Poultry Farm, with a yearly production of 54,000 eggs and 700-800 table poultry). In the Sanatorium Section, about 100 hours of work are done daily. The work in this section is not paid. Invalid soldiers are heavily insured and receive 70% of the average wage as pension. Full pension is paid to married patients, in addition to free medical attention and treatment. The unmarried, without dependents to maintain, are paid 50% of the pension during their stay for treatment. Such treatment is paid for by the Insurance Authority till complete working power is regained.

After a more or less lengthy period of treatment, the patients of the Sanatorium Section are discharged as soon as they can work six hours a day.

For the non-stabilised and for those who were not fully insured military persons, a third section, the After-Care Section, was built up. This After-care Section developed to meet a natural need, "in that patients who appeared no longer curable, and therefore, strictly speaking, no longer belonged to a Sanatorium, remained with us, because their state of health did not yet permit—or generally no longer permitted—their return to the normal life of the healthy wage-earner."

A hand weaving-room was instituted for these patients, "mostly sufferers from chronic stationary open pulmonary tuberculosis," so long as they were not fully insured, or were in financial straits. This hand-weaving room is fitted with all necessary apparatus: it carries on work as an independent industry and keeps its own accounts.

This handicraft work has procured a market for itself and is of proved merit and the payment of wages to the after-care patients becomes a possibility. In 1934 with a wage of 30 centimes per hour, 2,272.45 francs was paid in wages.

This division of the institution into three departments is considered to be a preparation for the creation of "a kind of colony or settlement, which remains in connection with the Sanatorium in its immediate neighbourhood, and in which the inmates with or without family live for a certain period in order that for a further period they may benefit from the favourable climatic conditions, and that the continuity of the treatment may still be guaranteed."

Sanatorium Boarding Schools.

Just as the military insured form a favoured and small group for which special and successful solutions can be found, partial solutions for temporary after-care are also possible for other classes of tuberculous. We may here touch briefly on these variations on the basic scheme.

One group is formed by young persons between 14-20 years of age, a period of life when tuberculosis frequently becomes active and at the same time the question

of choosing a vocation presses for decision; another group is formed by students who contract tuberculosis during their course of study, and whose education it is undesirable to interrupt. For the young a new type of institution has been created, which is aptly termed "a boarding school sanatorium"—a sanatorium which is carried on as a boarding-school, or a boarding-school which is carried on as a sanatorium. Two such experiments are familiar; the *Colonie Franco-Britannique* in Scillery near Paris and the Sanatorium Boarding School, Burrow Hill, England.

Colonie Franco-Britannique, Scillery, France.

The *Colonie Franco-Britannique* Scillery is a war-foundation and is traceable to the initiative of Bardswell.

Leading French and English philanthropists decided to buy an old property in the neighbourhood of Paris and give to young persons with healed tuberculosis a course of training in horticulture lasting a couple of years in order to qualify them to take up positions as gardeners in private or public service. The management is in the hands of Mlle. Baroness de Pitteurs and the medical supervision under Dr. Guinard.

A number of gardeners has actually been successfully trained and placed, but it seemed hardly advisable to undertake the relatively high costs of this professional training for so limited a number of pupils. For those in danger of contracting tuberculosis in France, the very much cheaper Preventorium system was introduced, and Scillery has to-day been transformed into a preventorium, in which gardening is used as occupational therapy.

Sanatorium Boarding School, Burrow Hill, Frimley.

The Sanatorium Colony of Burrow Hill, Frimley, carried on by the National Association for the Prevention of Tuberculosis, was reorganised in 1929 "for its present purpose which is to provide combined treatment and training for boys and young men suffering from tuberculous disease."

The principles of the Burrow Hill Scheme are clinical treatment and the recognition of the fact that social and medical problems appear insoluble unless special courses are provided for the young who suffer from pulmonary tuberculosis which is not arrested.

Of the 144 inmates of the 1934 course, there were 62 cases with positive sputum, 37 "with no records of positive sputum," and 43 surgical cases of tuberculosis. Sputum-positive cases have, according to the available statistics (Klare), a more unfavourable prognosis than the adult case of phthisis; and even when cases of tuberculosis are tubercle free, convalescence usually remains tedious and unforeseen exacerbations may occur at any time. For the group of ++ cases any scheme which is of limited scope both in time and extent of treatment will prove to be inadequate and will not meet the situation. Even for the +- cases in general, observation-periods of several years are generally required. Thus the average duration of training at Burrow Hill was one year, but half of the pupils were discharged before the end of the one year's course, the majority because they were "temperamentally unsuited for training," others because they had to be removed for reasons of health, a few to take up other work.

Special emphasis is laid on vocational training. Instruction is divided into three sections: gardening, clerical work, general education. The London County Council has declared itself ready to keep free for pupils from Burrow Hill five gardeners' places which become vacant yearly in the Parks Department. The results obtained were favourable, but the Colony has not yet been in a position to fill all five places. (90)

University Sanatoria.

While in most countries the care of tubercular students is limited to taking in hand their treatment and being of assistance in providing the opportunity to change their profession, in France and in Switzerland special "University Sanatoria" have been founded. These sanatoria are characterised by the fact that, in addition to the long periods which are usually fixed for clinical treatment, arrangements are made for a continuation of educational studies.

The Swiss University Sanatorium in Leysin is connected with the University of Lausanne. The academic terms are taken into account and even examinations are held. A strong movement is on foot to provide an international University Sanatorium in Leysin.

In France a Sanatorium des Etudiants de France St. Hilaire Ysère has been founded with the co-operation of state, university and students' representative bodies. This University Sanatorium, which has built up a complete clinical department, has at the same time provided all possible facilities for study. Laboratories have been built and a close collaboration with the University of Grenoble established.

An after-care home, in which convalescents can reside and continue their studies at Grenoble is included in the plan of organisation, which is still in process of development.

In these special cases the problem of the provision of a profession is again coming more and more into the foreground. Many attempts at professional education and re-organisation of education (a number of which had been made some years ago) were discontinued after the failures of the first year, and with absolute justification. Experience shows that it is impossible to train in the short space of a year professional workers capable of entering into competition with healthy men and women.

*Ecole Atelier de Réadaptation au travail, Marcinelle, Belgium.**

The experiment which is being made in Belgium to-day, at the suggestion of the Oeuvre National Belge contre la Tuberculose is therefore all the more interesting. An Ecole Atelier de Réadaptation au travail annexée au Sanatorium Les Bruyères à Marcinelle has been established as an after-care department of the Sanatorium Marcinelle. The essence of this experiment consists in its organisation. The school is under State control—Office de l'enseignement technique—and consequently under the direction of the Ministry of Public Instruction. The school is regularly examined by the Inspecteurs administratifs et techniques de l'Etat. It is subject to the same general regulations as the "École des Estropiers" in Charleroi, a well-known and modern vocational school, which gives to those desiring to enter industrial life vocational instruction, such as is given to ex-servicemen in the vocational schools. The State pays half the expenses, the Province 30%. The remainder of the cost is borne by the sanatorium.

A number of departments for carpentry, shoe-making and gardening—have been established in connection with the Sanatorium Marcinelle, though at present the work is in the main occupational therapy. The sanatorium has 112 beds, the average duration of treatment is three months, and the work is not paid. Permanent sheltered employment is not contemplated.

A woman social welfare worker (Assistante Sociale) is entrusted with the help of the Bureau de Placement, with finding employment for the discharged patients (91).

Scuola professionale, Camerlata, Como, Italy.

The Scuola Professionale of the sanatorium Camerlata, Como, Italy, is according to the intention of its founder a Sanatorium, which organises within the scope of ordinary occupational therapy training in a wide range of employment, but without forming an after-care department, and without specialising in any one industry. Its character as a school is emphasised by the fact that, at the conclusion of the courses, examinations are held, and diplomas and prizes awarded (92).

General Principles.

Until the present time two-fold institutions for sanatorium treatment and after-care have remained isolated experiments. An attempt at a general solution of this problem was made in Germany in 1936 by a decree of the "Reichsversicherungsamt" (93). By this decree the Insurance Authorities are empowered to make funds available for setting up "After-care Homes," which may be attached to sanatoria. This decree is part of a general enactment providing for the rehabilitation of the tuberculous. It is set forth as follows: "It is a fact frequently deplored that the present form of procedure for the treatment of tuberculosis does not fully accomplish its object as there are a large number of relapses. . . ."

"The position is just as unsatisfactory for those sufferers who after discharge from the sanatorium can find no work and cannot support themselves adequately out of the benefits which fall to their share.

"The process of treatment must therefore, after a successful clinical result, be completed by suitable after-care. For this purpose the following measures may be considered: (1) The transfer of the insured person, who has become unfitted for vocational work or is otherwise no longer equal to it, to this or other work by gradually re-acustoming him to his former vocational work, or by training him for another more suitable calling. Such a transfer should take place under expert guidance and superintendence in suitable after-care homes maintained by the insurance authority, and attached for practical reasons to sanatoria.

"The choice of the work in which the insured persons are to be engaged is subject to the judgment of the doctors. It depends on the circumstances of the individual cases and will be carried out in connection with the "Labour Bureau" and with persons experienced in vocational guidance. In this matter the deciding factor is not the value of the work performed, but the demands of health and the skill acquired in vocational work. It is also necessary to take precautions that the work performed by the patients shall not lead to any undesirable competition with trade and industry in the open market. It is far more necessary to see that the products of the patients are used for their own needs or for the needs of the sanatorium."

This decree concerning the application of the funds of social insurance to temporary after-care in special homes connected with institutions is the first step towards a general recognition and realisation of the idea of rehabilitation. The decree is based on the experience already gained in Germany in such after-care departments. There is, however, the danger that a schematic and doctrinaire application of this decree may mean nothing more than a lengthening of the period of treatment by a few weeks or months with emphasis on occupational therapy.

The British Ministry of Health (94) in its Report of 1932 points out that the creation of a type of institution, similarly divided into departments and concentrating on the function of social therapeutics, is extremely promising.

"A more hopeful field hitherto little explored would be the provision of workshops at sanatoria which the ex-patient could attend daily and would work under

constant medical supervision. A sheltered occupation of this kind with prompt provision for residential treatment in the event of relapse or recrudescence of disease might well tide the patient over the critical years that ensue after sanatorium treatment, as secured quiescence of the disease. Where such schemes usually come to grief is on the business side of the organisation. If this could be dealt with on the lines discussed in the Village Settlement section of this report more encouragement might be given to work of this kind.

"Midway between the sanatorium workshops for patients and ex-patients and the village settlement is a proposal which sets up workshops in connection with a sanatorium and also makes provision for the housing in cottages and hostels of patients who have completed their course of sanatorium treatment. The considerations which influence the selection of patients under the scheme are different from those dictating the choice of the Medical Director of the Village Settlement. The aim here is not to settle the ex-patient permanently but to re-establish his health, to prevent his being a source of infection in the home, to keep him away from temptation which would be prejudicial to his complete recovery and if possible to fit him to earn his own living outside at a subsequent date."

Urban workshops.

"Urban Workshops" are training centres with the object of carrying out industrial convalescence, but they are not locally or administratively connected with a sanatorium. While training centres control every aspect of the patient's life, the ex-patient who works in the Urban Work Centres remains free in the choice of his dwelling and in his mode of living.

The only establishment of this kind which has been developing steadily for 20 years is the Altro-Workshop in New York.

The Spero Workshop in London has been entirely successful in the ten years of its existence, but without appreciably enlarging the sphere of its activity. Some other establishments of the kind are struggling to make good, or are only on the threshold of their development.

*Altro Workshop, New York.**

The Altro Workshop was founded in 1915 with the idea "of providing graduated work under medical supervision."

The Committee for the Care of the Jewish Tuberculous is the proprietor and director of the undertaking.

Patients are admitted in all stage of the diseases. The proportion of 1st stages to 2nd stages to 3rd stages is 14 : 68 : 18. Admission is not limited to negative cases. 45-50% had positive sputum either during the previous treatment in the sanatorium or hospital (+), or even had it on admission to the Altro Workshop (++).

These three groups of the -, +- and ++ cases are not being followed up separately in the statistics.

The family is the unit of the welfare work. The Committee, by means of the numerous special clinics under its control, has provided medical and economic supervision of the whole family. Special treatment is provided. The earnings are amplified by subsidies, so that the patient and his family obtain the necessary minimal income.

Patients who are not yet fit for a full-time working day and need "part-time sheltered work" are admitted. Most of the cases have favourable prognosis. Dubious cases are occasionally admitted on probation. Approximately 90% of

the cases are "temporary care cases," who it is expected will become fully capable of employment in normal industry (graduates) within three years. With regard to 10% of the cases, it was recognised at the time of their admission that they would need sheltered employment for an unlimited period.

The Altro Workshop is a factory for supplying washable goods and uniforms for hospitals, institutions, hotels, restaurants and industrial concerns. Patients need not necessarily have had a preliminary training. When the scheme started the Altro Workshop worked by contract for another factory. This had the advantage that little capital and no selling organisation were required and no business risk was run, but it had the disadvantage that scarcely enough was made to cover the bare expenses of the work, to say nothing of the costs of management, etc.

The workshops were at first housed provisionally in a two-storied wooden building in Bronx, New York City. The roof was arranged as a rest-hall.

In September, 1934, a newly-built factory was occupied, and this is working to-day. There is room for 145 workers. The number of workers varies between 125 and 135.

The rooms for receiving and for despatch (including rooms for the sale of wares and for ironing) and store-rooms are on the ground floor, offices, sisters' rooms and work-rooms on the first floor, dining-rooms and rest-rooms on the upper floor, part of which is laid out as a roof-garden.

The working hours are fixed by the "factory physician" in accordance with the clinical record and previous history of each patient. The working time of the newly admitted is usually three hours; there are fortnightly "screenings and film examination" when necessary, but always before discharge as fit for work (graduation).

Wages are paid as soon as the worker performs useful work, usually after two days, as the untrained worker is started in the simplest section. 66% can be regarded as untrained workers. Subsidies for supplementing the wages amount to 30,000 dollars per annum. In addition many patients receive State assistance. The wages are maximum wages, never lower than the tariff piece-rate wages of the Trade Union. (The subsidies make short hours of work possible.)

Sales are solicited by post and commercial travellers employed as agents.

The Altro Workshop is known for the quality of its goods, but it cannot compete with the manufacture of cheap clothing.

The working time is limited to 36 hours a week distributed over five working days. The hours have been voluntarily reduced to this number in compliance with conditions of the Federal National Industrial Recovery Act.

In the course of time 13 important foremen's places—which had been occupied earlier by healthy employees—have been filled by the "apparently cured."

The Altro Workshop is the After-care Department of an organisation which has undertaken full responsibility for the medical, social and economic care of health and after-care of its members. The Altro Workshop is thus a unit of a complete Anti-tuberculosis Scheme. There exists a close connection between the sanatoria and the after-care workshop, and also with the State rehabilitation service and economic assistance organisations. These latter make it possible to finance the short-time work of substandard workers, to guarantee a standard of life, to place the "graduated" on the open labour market and to grant permanent sheltered employment to a small group of foremen.

The Altro Workshop in its new form is a model of a Sheltered Industry. It plans gradually to accommodate the workers (at least the unmarried) in suitable hygienic quarters in the neighbourhood.

The Spero Workshop in London, Factory in the Field (Leeds, City Council), Bristol Appliances (Bristol), Cleethorp Municipal Workshop (Cleethorp), Boston Workshop (Boston, U.S.A.) are all organised on similar lines; but all these workshops, notwithstanding their existence for many years and their suitable organisation, are limited to a relatively small number of patients.

The English schemes have been repeatedly described in detail in the Reports of the Employment Committee of the Joint Tuberculosis Council.

Spero Workshop, London.

The Spero Workshop (95) is a foundation of the Central Fund for the Industrial Welfare of Tuberculous Persons. Originally it was designed for Ex-servicemen only and to-day only citizens of London are admitted, for the L.C.C. subsidises the workshop. Only those patients are accepted who have previously been trained in leather handicrafts for at least six months in King George the Fifth's Sanatorium at Godalming.

Leather-work was originally the sole industry, but lately glove-making has been added as an occupation for women, which has the advantage that a part of the work can be done at home.

The average number of workers is 28; these, who are paid by the hour, work 44 hours per week and earn—supposing that a "six months' " training has been undergone—30 shillings a week. The maximum earnings for foremen is £2 per week. The overwhelming majority of the workers are still to-day ex-servicemen with pensions. The turnover comes to about £2,000 in the year.

The subsidy required by this undertaking is about equal to the wages that are paid. According to Bardswell, an industrial undertaking for the disabled is economically justified so long as the necessary subsidy is not higher than the wages paid.

In contrast to the case of the Altro Workshop the wages are not automatically supplemented. The scheme is therefore applicable essentially to war-pensioners or to single men and women, for whom a full wage is not necessary.

*The Boston Workshop.**

The Boston Rehabilitation Workshop was established in 1930 by the Boston Tuberculosis Association. The use of a former school-house was granted by the town and the capital for the establishment of the Workshop was presented.

The object was "training and suitable employment" for ex-patients of sanatoria, who were able to work but could only do so for a short number of hours.

The immediate incentive for its establishment was the unfavourable experience of the Placement Bureau of the same Association during the previous six years. The work of this bureau has always suffered from the fact that it could not answer effectively the first question of an employer, what work the ex-patient was capable of doing. In addition, experience has shown that, at least for a transitional period, part-time work in some form must be provided for the ex-patients of the sanatorium.

The clinical control and medical supervision are ideally organised. A patient who can work eight hours a day is fit for discharge. The placing of workers with the assistance of a trained public health worker has led to most satisfactory results. The workers receive a scanty breakfast, a mid-morning lunch and a hearty dinner at 12. One hour's rest in the day is prescribed.

"Two serious problems connected with the shop had to be met. One is the securing of supplementary aid to provide sufficient income for the patient. The other is the housing of those ex-patients who on their discharge from the sanatorium may secure work in the shop but have no home. In connection with both of these problems other social agencies of Boston are most helpful in providing both material aid and housing facilities."

At the moment 30 patients are employed. The wages are 18-35 cts. per hour and are supplemented by the various funds and societies.

The turnover in 1936 was 6,500 dollars. Silk and artificial silk washable fabrics, all sorts of carpentry-work, copies of old chairs and tables are made, and there is a good market for these quality goods.

Having regard to the small number of those employed, the costs are relatively high. The total budget for the year 1937 was 24,540 dollars. It is intended to increase the number of workers and even to bring in "boarding patients" from towns and villages of Greater Boston. "Although the shop may never be self-supporting, we believe that in time it will meet the greater part of its cost through the admission of more patients, better and quicker work and consequently an increase in sale."

Principles of Urban Workshops.

Such Urban Workshops are, in themselves, non-institutional after-care establishments which are in the first place, established for temporary after-care. From the economic point of view they have an apparent advantage over other types of after-care institutions in that they have not to trouble about dwelling-accommodation, etc., but they look after the family as the unit. They have a disadvantage in that no maintenance costs can be granted for their work. Although some local authorities believe that by such industrial establishments the cost of after-care will be decreased and that eventually they will even save the grants in aid.

Urban Workshops have often undertaken to provide maintenance and even housing; and as they usually obtain the wages from some central fund, in order to pay for the work-hours not worked in cases of part-time work—in order to ensure a satisfactory standard of living—it may be that the cost of the various forms of after-care are approximately equal.

The ultimate form of these Urban Workshops has not been determined. Semi-institutional establishments may be preferred, e.g., homes for the unmarried, with industries, or else "day-sanatoria" which are combined with workshops. Such semi-institutional forms have the great advantage in that the local authorities contribute to the expenses in the form of maintenance subsidies. It is not possible under the present system to people the workshops other than by the sanatorium authorities officially recognising them as centres to which they will send their ex-patients for after-care.

Urban workshops which are not after-care departments of sanatoria and not associated even with any existing form of after-care organisation may of necessity meet increasing difficulties to populate the workshops.

In this way the tuberculous should enjoy the same amenities as the blind; especially if on principle a supplementary wage is granted to him and the responsibility of Society is acknowledged for as long as the final results of treatment and after-care are not satisfactory.

Sanatorial Village Settlements. Papworth Scheme.

When in 1915 Varrier-Jones brought the Tuberculosis Colony into existence, he made use of two incontestable facts; that the sanatorium system was not in a position to make a number of tuberculous—who were becoming a heavy burden—fully efficient wage-earners, and that no after-care organisation introduced a sufficient protection to make it possible for the tuberculous person to use his diminished earning capacity for earning a living without injury to his health.

"It was in the year 1914 that we became dissatisfied with the progress of men and women whom we had sent to a sanatorium and who had returned markedly improved in health but utterly unable to follow their previous employment. The problem was not a new one. It beset and still besets everyone connected with the after-care of the consumptive and our experience in those early days was by no means exceptional. Our first thought—there again we were not conspicuously original—was that it might be possible to find a number of sympathetic employers who would be prepared to give such persons some light work . . . We searched the country for such people . . . with almost complete lack of success . . . After prolonged consideration we decided that since no one else could or would do so, we would ourselves provide suitable work for our patients. There seemed to be no other course open to us. And thus we began." (Varrier-Jones 96.)

The Village Settlement is intended for permanent colonisation, or rather for the permanent colonisation of those patients who have still regularly positive sputum, or who have had repeated relapses. It is not intended for the permanent colonisation of only the "arrested cases."

"There can be no 'stay too long' in the case of those persons with permanently damaged lungs; in those who have from time to time exacerbation of the disease, and who consequently at such times cough up immense quantities of bacilli. Village Settlements are designed for such cases; those very people who are such a problem in the outside world and, indeed, are the problems of the ordinary sanatorium. Those whose sputum was once, and once only, positive when in the army, and in whom the bacilli have never more been demonstrated, are, to my mind, in an entirely different category, and those persons should never be classified with those for whom the Village Settlement is intended. To all intents and purposes they are fit persons and certainly no danger to the community. There should be no place for them in the Village Settlement. But for the non-arrested tuberculous there is no more ideal place for treatment and after-care than the Village Settlement, and no more ideal place for the family, remembering always that the family is the unit to be dealt with, and that we waste time and money unless our work centres round this unit" (Varrier-Jones 97).

With these words our task is defined and the type of patients to be benefitted is described. The "hospital and sanatorium of such a Village Settlement see to it that all therapeutic measures are employed in order to obtain as far as possible stabilisation of the disease and if possible its 'Arrest.' Those patients who have suitable homes to which to return and who are looked after by the After-care Committee in Cambridge as to their employment, are discharged if the disease is sufficiently arrested." (Varrier-Jones 98.)

The class of patients, for whom the conditions for admission into a Village Settlement are given is thus a section cut out of the tuberculous population: the wide group of the ++ and +++ "good chronic cases" and its border-line cases. We can safely say that 30-40% of those discharged from sanatoria to-day are

still in a state for which the Village Settlement has hitherto given a satisfactory and ideal solution. Not for all these ex-patients is the village settlement suitable, but for a great number of them it offers the only suitable environment.

Although the Village Settlement was created for a definite group of tuberculous people, experience has shown that it is not possible to leave the selection of this middle case to sanatoria or to welfare centres; it is the essence of the Papworth Scheme that this selection can be made only through the Papworth Scheme itself.

For this reason the conditions for admission contain no limitation with regard to the various stages of the disease; patients with any form of tuberculosis are admitted as potential settlers. Although sanatoria interested in Papworth strive to send patients to Papworth who are suitable for the Settlement, the multiplicity of the initial material received makes it necessary for Papworth to cater for all types of cases, medical treatment, occupational treatment, temporary occupational after-care, occupational after-care of indefinite duration, hospital treatment and finally colonisation with permanent sheltered employment, all are provided.

"The increased industrial activity has necessitated an increase of our accommodation of settlers in the village. It has also necessitated the increase of our purely institutional beds to provide for the increased flow of patients anxious to take advantage of our scheme" (99).

"Papworth Village Settlement forms a complete unit with a hospital for advanced cases, sanatorium suitable for this form of treatment and the Village with its Hostels and Houses, Workshops and Recreation Hall."

Papworth is, in the words of MacNalty, an entirely new type of institution (100). In the structure of Papworth the fact finds expression, that the tuberculous person is temporarily a medical, but permanently a sociological problem. The development of the threefold Papworth unit is the result of a steady adaptation to external and to internal forces.

In 1916, with a capital of £380, a farm-house with two acres of land in Bourn (Cambridgeshire) was taken over. Twelve patients were admitted in the first place for a treatment and subsequently training in a variety of trades.

In 1917 Papworth Hall was bought. The hospital was at first accommodated in the Hall. To-day the hospital unit consists of two large new modern buildings: the Bernard Baron Hospital for men and the Princess Hospital for women, and a surgical section. This latter meets all the demands of modern pulmonary surgery.

The medical services of the village settlement are developed from the hospitals; and it may be divided for purposes of description into the following units: ante-natal, ophthalmic, dental, ear nose and throat, orthopaedic, collapse therapy, two radiological units, the psychology unit, and industrial physiology (research) unit. The research units are developed into the following departments: bacteriological and pathology and biochemical.

With an out-patient department connected with all these departments and in itself forming part of the main hospital organisation, the medical staff are able to ensure the smooth working of an articulated scheme of continued medical care and treatment throughout the village, hostels and sanatorium chalet section.

After the conclusion of clinical observation, and as soon as he does not need further hospital treatment, the patient is transferred to the sanatorium unit. The Papworth Sanatorium is a new feature when compared with the ordinary form of sanatorium. It is more a Post-Sanatorium, an After-care Colony; the invalids are certainly patients, but, owing to the form of accommodation in shelters or hostels and to the work in the workshops, they have a far greater mobility. They enjoy the freer atmosphere of living in a settlement, even though they are not yet free settlers. The sanatorium unit is formed by a group of shelters and hostels for 295 men and women. Hospital and sanatorium with its approximately 480 beds forms one of the greatest units for the training and treatment of the tuberculous in the country.

The hostels accommodate a large number of unmarried men and women, and men and women whose families have not yet followed them, but who have already "graduated" and earn a wage; this wage in part makes it possible for them to pay fully for their board and lodging, either out of the wages alone or by drawing on pensions, contributions from Local Authorities, etc.

The Village Settlement is the workers' settlement of the Industries. In the course of years more than a hundred cottages have been built, mainly from gifts, and erected by the building department of the settlement itself. Every year some new cottages are added. At the present time the building of cottages is continuous.

"In glancing at the Reports from 1933 I am struck by the feeling that it is already out of date, for on every page there is evidence that we have made considerable progress since it was written. The Village Settlement in contradistinction to the ordinary sanatorium must be an ever changing and ever progressing entity. Progress is essential. We can never say that we have arrived, any more than London can say it has arrived . . ." (Varrier-Jones 101).

Varrier-Jones gives repeated warnings against the mistaken view that everyone "who is assigned to the institution can in a short time be taken over into the Village Settlement."

"We select on principle no early cases for the Settlement, but we attempt to accommodate those who are unsuited to finding work outside. It is clear that they can then be taken into the Settlement only to the extent that dwellings and work are to be had."

In the Papworth Scheme, all efforts are concentrated on employing the earning power of the patient in the optimal way, to make him if possible fully "self-supporting." "After-care must therefore mean sound economic conditions and nothing less will ever bring success." (Varrier-Jones.)

The development of the Industries at Papworth is therefore the requisite condition for success. The turnover has steadily increased from £401 in 1918 to £85,551 in 1934, and is steadily rising. "Papworth Industries" is in no respect distinguished from any other well-organised industry in the country. The whole factory concern is rationalised, machinery is installed wherever it is economically necessary.

The following figures indicate the growth of the institution :

Year	Hospital Beds		Shelter Beds		Hostel Beds		Cot- tages	Sales	Industries	Various
	m	f	m	f	m	f		£		
1914			1							
1915			9						Gardening	
1916			12						Carpentry	
1917			15							
1918	25		25				8	401	Cabinet-making Boot-repairing Poultry farming Tailoring	Shop
1919	60		60		18		22	3,935	Printing Trunk Making	
1920	60		75		53		22	10,438	Sign-writing	
1921	68		90		70		50	14,595	Upholstery	
1922	68		90		70		50	17,434	Building Dept.	
1923	68	20	90		70		52	22,179		Laboratory
1924	68	20	90		70		58	32,479	Enlarged Print- ing Uphol- stery, Cabinet Depts.	
1925	68	20	90		70		71	35,656	New Trunk Dept.	
1926	68	30	90		70		78	40,426	Fibre Case Dept.	
1927	68	36	90		70	6	82	47,893		Village Hall
1928	78	36	90		70	6	93	54,381		
1929	78	36	90		70	42	99	64,705		
1930	78	36	90		70	45	102	68,437	Extens. Carpenter Shop.	
1931	78	36	100		90	45	104	71,927		
1932	78	62	135		90	45	104	72,115		
1933	85	62	135		90	45	106	88,124	Extens. Carpenter Shop.	
1934	96	62	135		100	53	106	85,551		
1935	107	73	135		100	54	112	107,213	Surgical Unit	
1936	103	77	137		101	54	120	119,141	Village Stores	

The wages share in the turnover is only 25%, the business principles are therefore thoroughly sound. The undertaking is self-supporting with the one reservation, that all new purchases in machinery and the new buildings of the workshops are procured out of capital which has been presented.

Every year detailed Annual Reports on Papworth and Papworth Industries are published; from these reports the development of the various industries is to be seen. (102)

As long as the patients are not self-supporting settlers, the County Council, etc., who have sent them in pay maintenance subsidies, but these are reduced according to a "sliding scale." "The reduction of maintenance fees on a sliding scale introduced some three years ago (1931) has operated most successfully. More and more Local Authorities are taking advantage of the scheme."

The solution of the sociological, economical and medical problems confronting tuberculous persons is the primary object. Secondly, a great number of factors governing treatment and social hygiene are being undertaken—and indeed in an optimal form. This is in accordance with the established intention of Papworth. "The Village Settlement grafted on a hospital-sanatorium scheme is a most helpful means for ensuring the after-care and well-being of a certain proportion of patients suffering from tuberculosis." (MacNalty 103).

Preston Hall Sanatorium and Colony.

"Preston Hall, Maidstone, Kent (32 miles from London) is on the main road from Maidstone to London. Here the old mansion is the centre for the management and medical service, and at the same time fulfils the office of both hospital and clinical department. Bardswell in 1932 gives the following detailed report on Preston Hall with regard to "the part it has played and is now playing in the Council's scheme for the treatment of tuberculosis." (104)

Preston Hall was established in 1920 by a body of philanthropic workers who banded themselves together under the name of "Industrial Settlements Incorporated." The intention of the promoters was to establish an industrial settlement for ex-servicemen who had contracted tuberculosis during the War.

Preston Hall, a country mansion built in 1858, with 250 acres of land was secured for this purpose: . . . and in 1920 was occupied by 300 patients. The committee of management aimed at combining sanatorium treatment with training for work on the land, with the intention of placing the ex-patients, when sufficiently trained and convalescent, in rural occupations. In addition to training for the land (including horticulture, poultry breeding), "portable buildings" were made in workshops. The industries were carried on with quite a considerable loss.

On April 1st, 1925, the establishment was taken over by the British Legion. The previous results were satisfactory only in the domain of health. But only a few ex-patients could be settled. Here, too, the old experience was confirmed, that work on the land is rarely suitable for tuberculous ex-patients.

Varrier-Jones undertook the re-organisation of Preston Hall in 1925. The agricultural occupations were given up. "Under the direction of Sir Pendrill, the institution was re-modelled on the lines of Papworth and the training was re-organised on industrial lines. Workshops being built and equipped with the most efficient labour saving machinery."

After the re-organisation had been carried out, Sir Pendrill, after two years, gave up the management to Dr. MacDougall, who has since continued to develop the scheme.

Preston Hall now consists of :

1. The original Hall with administrative, dining and clinical quarters with 105 beds, X-ray department, laboratory and operating theatre.
2. Huts (Shelters) for 69 patients.
3. Three hostels for 48, 40 and 38 persons respectively.
4. The village with 127 houses for married persons, village hall, shop (in which the settlers can buy everything), post office, restaurant, school and playground.

For the industries modern workshops have been equipped with the newest machinery.

1. A workshop for "portable buildings" with a turnover of £16,000, employs 50 ex-patients and 15 patients.
2. The printing department does work for all branches of the British Legion, the Red Cross and various firms and business houses in the country, with a turnover of £10,000, with 17 settlers and eight patients.
3. "Fancy Goods Department" employs 15 ex-patients and 16-20 sanatorium patients, with a turnover of £10,000.
4. "Graining Department" (wood graining, asbestos graining), works with a turnover of £12,000, with nine ex-patients and six patients.
5. Village Store, with a turnover of £20,000, employs eight ex-patients and four sanatorium patients.

Garden and farm, management of the estate, management of the institution, book-keeping, institution-service (housework, engineering, painting, etc.), employ 56 ex-patients and seven patients.

Two-thirds of the settlers are thus employed in the industries, one-third in the activities of the management and institution, and five settlers as travellers (in all 160 as against 60 patients).

The turnover in 1934-35 was £80,000. Of this, £26,000 was paid as wages, salaries and provision for settlers; in round numbers "for every 100 pounds paid in wages, £400 worth in goods must be sold by the Industries." The average wage is 1/3½ per hour. Patients, as long as they are under treatment, receive 5s. per week, if they work at least 22 hours a week.

The minimum number of hours of work for settlers is 36.

Since 1925 the British Legion has built 75 new houses with a total expenditure of £40,000. These houses are let at 6s. a week, including rates. The rent is thus a non-economic one.

In all, the British Legion has expended during the years 1925-32 £100,000 "in developing the various activities of the institution."

The policy of the British Legion at the moment is directed, not to the building of more houses for married men, but to the building of hostels for single men, whose expenses, calculated for the individual, are very much lower.

Papworth is the free community of men and women stricken down with disease who have felt prepared to "throw in their lot with the scheme," after they have been treated for at least six months as patients in the hospital and sanatorium.

Preston Hall, the daughter-settlement of Papworth, has, it is true, been built up primarily from the same point of view, and has the same three units to-day. But the scheme as such has assumed a different character: "A new scheme which has just been approved by the British Legion will materially alter the prospect of admission into the settlement. Briefly, residence in the settlement is in future to be regarded as a continuation of residential treatment to be terminated, when such treatment is considered to be no longer required." (105)

Patients who are taken over into the settlement give an undertaking to leave the settlement after five years, if they shall be completely cured. The immediate incentive to make this change of principles lies in the wish to get houses un-tenanted, for it is only a small fraction of those that really ought to be settled that can be settled (about 25% according to the statistics of discharges in 1937).

Since among the inmates of the institution the members of the British Legion become fewer and fewer, and the Local Authorities have not so far made up their minds to take part in the settlement-policy at Preston Hall, space must at the present necessarily be made by these five yearly exits. The distinguishing characteristic of Preston Hall, including its settlement, as an establishment for institutional treatment forces on the attention of the Local Authorities the fact that they cannot be freed from the duties imposed by law upon them, even towards those who are accommodated in the settlement at Preston Hall.

This new regulation has the advantage that the Local Authorities can be made to pay for the whole period; in principle, however, it indicates no important change in the policy, for in the selection of settlers, according to the unanimous desire in Papworth and in Preston Hall, no stabilised or healed ex-patients are received, but the labile, and above all, those that are still infectious but able to work (+ + and + - + cases), who cannot enter the open labour market, and who, therefore, should not be allowed to return to their old homes.

MacDougall further excludes all cases, in which the therapeutic results have been brought about by operations (plastics, pneumothorax, etc.), but functional defects have remained; "all such and similar cases would never be asked to leave the village settlement even if they are technically speaking 'recovered cases.'"

But for the few who in spite of this measure are affected, the severity of this regulation is appreciably softened. Either a sum is paid to them which makes it possible for them to establish their own existence in their new home or in an "Ex-Patient Settlement" with non-institutional care in the vicinity of the Institution. "Keymen must at all costs be retained so long as their services are required even if their tuberculous process is arrested. These form the nucleus around which the settlement as a whole must be built. The growth and development of the industry at Preston Hall has made it possible for us to absorb a number of recovered cases, who are not even keymen and houses outside the Village Settlement were found. There has been ample work for all in the Industries." (106)

The work of the Village Settlement has been concentrated more and more on the "middle case," as Varrier-Jones has repeatedly insisted. "The sanatorium with industrial workshop has so far proved the most satisfactory solution of the problem of the chronic ambulant type." (107)

Barrowmore Hall Sanatorium and Colony.

Another settlement in England, which has developed independently of Papworth, has not yet attained an importance equal to that of Papworth and its daughter-settlement.

The East Lancashire Tuberculosis Colony and Sanatorium of Barrowmore Hall in Cheshire is described as an "institution for the sanatorium treatment of male cases of pulmonary tuberculosis and certain types of laryngeal tuberculosis and for the colonisation of suitable cases in the attached settlement" (Annual Report 1933-35, E. L. Sandiland 108).

In 1920 the British Red Cross Society and the Order of St. John established on a site of 120 acres near Barrowmore a sanatorium, training colony and village settlement, in the first place for ex-servicemen, "but automatically for general use."

By 1935, and so within 13 years, 20 families with 55 members and 16 unmarried persons were admitted. The admissions into the sanatorium section amount to 160 per annum. 35% of these were advanced cases of tuberculosis.

Barrowmore Hall has not been able to develop its industries (carpentry, joinery, firelighters, potato boxes, furniture, upholstery, printing, boot repairing, poultry rearing and egg production, gardening and fruit farming) to the extent that the directors would have wished, and to the extent that would have been necessary to employ a larger population of settlers. In 1935 a new manager was installed and the industry was re-organised.

From the reports of the Tuberculosis Officer of Lancashire, Lissant Cox, it follows that the populating of Barrowmore Hall has been done within the framework of the anti-tuberculosis scheme.

The Ministry of Health on Village Settlements.

The Ministry of Health has repeatedly discussed the question of the Village Settlement. "The Ministry of Health has from the beginning taken great interest in the establishment of Village Settlements. It has regarded this institution as an attempt of the highest importance to solve one of the most difficult problems which has arisen out of the National Scheme for the Treatment of Tuberculosis, namely the problem of after-care of the tuberculous who have received treatment, or treatment and training in sanatoria.

"The Ministry has given financial contributions to Papworth, the first Village Settlement in England, and to Preston Hall, a Village Settlement for ex-Servicemen. . . . It encourages the continuation of the experiment of Barrowmore Hall in Cheshire, a small colony, which is administered by a voluntary Committee. At the moment, the Ministry in association with a number of County and Borough Councils is examining the question of establishing Village Settlements for Tuberculous Persons in other districts . . . and recommends that Industrial Settlements should be set up in connection with a 'satisfactory hospital in the authorities' area.'"

The Ministry of Health gives the following definition of Village Settlements: "The Village Settlement consists essentially of a Hospital-Sanatorium (which treats patients in nearly all stages of the disease), with the establishment of an industrial section in association with it, a section where the treatment can be prolonged and training in a suitable calling can be begun. The Village Settlement gives permanent employment under good hygienic conditions in a variety of trades, and pays Trade Union wages to its skilled workers, and in this way it forms a village community, in which work at an industry is combined with country life. It cannot cure every case of tuberculosis, but can lengthen the life of the majority of cases."

The following estimate is drawn up :

Annual Debt Charges on Loan of £100,000.

Interest at 5%	£5,000
Amortisation at 5%	5,000
Total Charges	£10,000

Annual Revenue from Local Authorities.

In respect of 80 single tuberculous persons at 10s. per week	2,080
In respect of 100 married at 10s. per week	2,600
In respect of 100 wives of above at 10s. per week	2,600
In respect of 200 children of above at 10s. per week	5,200
Total Revenue	£12,480
Excess of revenue over expenditure	£2,480

In 15 years the capital would be amortised and the regular subsidies would be reduced correspondingly. By the employment of workers who would otherwise be permanently unemployed, the income of the State Insurance Fund would thereby be increased.

This scheme of course applies only to "partially disabled and totally unemployable persons of suitable temperament."

By diverting unconstructive relief expenditure to the service of a Village Settlement loan in the manner indicated the lot of substandard persons and their children can be immeasurably improved without adding one penny to public expenditure and with the prospect of greatly reducing that expenditure in the future."

The immediate question which is to be answered in the first place is the share of the Local Authorities in populating the two great Village Settlements of Papworth and Preston Hall. On the repeated recommendation of the Ministry of Health, the London County Council has adopted the populating of Papworth and Preston Hall in its programme. Other communities, too (Local Authorities, Counties), as well as the counties of Kent and Cambridge, are prepared to send patients into the sanatoria of the Village Settlements. The management of the two settlements has already undertaken a permanent reduction of the maintenance costs in certain cases whose stay in the Institution has been a prolonged one and whose chances of eventual reception into the Settlement are good.

In 1930 the L.C.C. announced in its Annual Report : (110)

The Council sends a number of patients to Papworth and Preston Hall at the expense of the anti-Tuberculosis Scheme, in part at the expense of the Public Assistance. A careful selection is made with the intention of sending in patients of whom it may be expected that at some future time they will be able to find their living as employees or workers in the Industrial Settlement. But a particularly difficult problem is presented by the case which, after 12 or 18 months' treatment and preparatory time, continues to have little prospect of being taken into the Settlement. The discharge of such patients after 18 months' training is not only a disappointment for the patient but a waste of time and money. The Council has found a compromise, to provide a regulation for those patients who, it is true, cannot become fully competent wage-earners, but nevertheless represent some economic value in the Settlement.

The Council will pay the difference between "the value of the patient as a wage-earner and the cost of his maintenance." This regulation is tested at regular intervals.

In 1935 it is reported that this regulation has stood the test and will be carried out further.

"In addition to the number of patients accepted as permanent settlers at the Village Settlement there are a certain number of settlers for whom owing to their permanent disability a weekly partial maintenance fee of from 10s. to 20s. is paid and such settlers are regarded as continuing to receive residential treatment under the Tuberculosis Scheme" (III).

The Committee of Management of Preston Hall has attempted to find a rather general solution for the share of Local Authorities in populating the colonies, on a basis which Varrier-Jones has suggested in his Memorandum. (page 125).

The Local Authorities, etc., shall pledge themselves to pay £78 for a married person and £52 for a single one yearly. On the other hand, no capital share for house-building or workshops would be claimed. The tuberculous man himself and his family would have medical supervision, without, on this account or on eventually re-admission to the hospital, the authority's incurring any additional expense.

The Welsh National Memorial Association has already adopted this method of providing inmates.

Although five years have gone by since the Ministry of Health required the Local Authorities to establish Village Settlements or to attach them to their sanatoria, up to the present there has been only one isolated plan, which has received the support of the Ministry. This plan originates from the Medical Officer of Health of the County Council of Nottinghamshire (II2). It provides for the establishment of a small Village Settlement which for administrative and medical purposes is to be connected with the County Council Sanatorium of Ransom.

"The settlement should be planned as a unit distinct from the sanatorium but quite accessible to it so as to establish a communal interest not directly associated with the atmosphere of invalidism, yet so near as to secure medical supervision and, if necessary, retreatment and at the same time ready access to the settlement workshops for patients undergoing treatment in the sanatorium, who had reached the state of fitness, enabling them to attend the Workshops daily for training and trades with the view to their later colonisation. . . ."

"... If from the beginning it is recognised fully that the settlement cannot be a 'commercial' success, further that its apparent financial failure represents mainly a transference of existing unremunerative expenditure to other channels richly remunerative in producing something where before there was nothing—then the Settlement will succeed and from success will emerge its real productive output—human lives."

Health City, Clairvivre Dordogne.

The development and the success of Papworth Village Settlement have aroused interest and admiration throughout the world, and from innumerable quarters the wish has been expressed to create similar establishments.

But in practice no one has had the courage to repeat the experiment of Varrier-Jones.

La Cité Sanitaire de Clairvivre (France) (II3) is traceable to the stimulus given by Papworth. The original plan, which goes back to Hazemann and which received the support of Leon Bernard, embodied the principles of the Papworth Scheme as an ideal. But the promoters—la Fédération des Blessés du Poumon—saw only one side

of the Papworth Scheme, the large community of tuberculosis settlers. They overlooked the principles on which this community had been formed, how it had grown slowly and to what vital laws the structure was subject. The result has been that one of the finest plans ever created which in magnitude even surpasses Papworth, has miscarried. The Papworth principles have not been put into practice.

In 1919 the Tuberculeux Victimes de la Guerre sought new remedies to combat their disease. The sanatorium reminded them too forcibly of barrack-life. They thought of establishing an independent community where they could live and work according to their powers. Delsuc, the President of the *Fédération des Blessés du Poumon*, visited Papworth and Preston Hall and induced his federation to open a campaign for the establishment of such a settlement in France.

In June, 1931, a sum of 52,000,000 francs, by Parliamentary decree, was handed over to the F.N.D.B.P. with the stipulation that such a settlement was to be founded. A site was secured near Périgord, which in 1950 will pass with all the buildings that will be erected there, into the possession of the State.

In this way Clairvivre was created, 177 cottages with 350 dwellings were built, a hotel-sanatorium consisting of 7 storeys and having 211 rooms equipped with baths, roof-garden, etc.; a Hôpital Dispensaire, with its welfare centre, clinical section, maternity section, and surgical section, electrical power station, a large general store, drainage with specialised sewage treatment, garage, laundry, school workshops, cinema, and in fact a whole small modern town, where Dr. Forestier laid down the principles for a complete scheme of social service.

The plan is not yet quite complete, but new credits have now been voted, which presumably will permit the final completion of the hospital.

When Clairvivre was first started it was a great success. The inhabitants increased rapidly in numbers. Six months after the opening 116 colonists had moved in and 2,000 had put their names down for admission. But very soon the tide turned, and by July, 1935, the number of inhabitants fell to 61, and has since fallen still further.

The number of unmarried boarders in the hotel never exceeded the initial number of 28.

The reason for this crisis in Clairvivre is in the opinion of the F.N.D.B.P. in Paris based on a number of causes: Press attacks, lack of means to bring the building work to a conclusion, opposition of the doctors and of the leading medical societies.

But there are other reasons just as responsible, reasons which have hitherto not been sufficiently appreciated by the management. The management of the F.N.D.B.P. had nothing else in view but opening the gates of the Health City of Clairvivre to the tuberculous and to make possible for them a life adapted to their disease. They believed that every tuberculous person would only be too ready to settle in Clairvivre, because the high pensions which the members of the F.N.D.B.P., like all war-wounded draw, makes a thoroughly suitable standard of living possible. The F.N.D.B.P. is convinced that the problem of the tuberculous can be solved in a very simple way, viz., for tuberculous patients with ample pensions to occupy a house in the Cité Sanitaire and have in addition the opportunity of congenial employment for themselves and their families in the industries which were about to be built up. The whole plan of the F.N.D.B.P. ultimately resolves itself into a gigantic Housing Scheme and so is just the antithesis of the Papworth Scheme.

The Hôtel Sanatorium took the place of the hostel section in the Papworth scheme, but with this difference, that neither systematic medical supervision nor systematic occupational therapy was employed. The disinclination to adopt any form of the routinary sanatorium treatment went so far that the doctor played the part of a hygienist and house-physician in the hospital which was also intended to be the general hospital of the locality. While Papworth has built up step by step the Sanatorium Section, the Industrial Section and the Village Settlement, here there is a large village of a size many times that of the Papworth Settlement, but with the medical side in an entirely rudimentary condition.

If a Housing Scheme was to be built, not the Dordogne but a suburb of Paris would have been better for this purpose. The explanation of the failure of the Clairvivre experiment in its first phase, apart from the erroneous conception of a Health City as a residential settlement, lies in the misunderstanding of the psychology of the tuberculous person and his family. A tuberculous man who has no chance of finding a livelihood (and without a livelihood is in misery with his family) will reside almost anywhere where a livelihood can be made, and the family will gladly go with him, because as the breadwinner he is the most important part of the family.

But if a standard of living is guaranteed by a high pension, the family will prefer to remain in its accustomed surroundings and amongst its neighbours and friends.

Tuberculous families will take advantage of the amenities of a settlement if by so doing they are materially and psychologically better provided for. Thus these settlers in such a community must build up industries to enable them to make a living, and these industries can be built up only if a natural selection among the settlers takes place, and this is possible only on the principles which have been put into practice at Papworth.

There are certain laws in such experiments in medical sociology, which are just as powerful as the law of gravitation. In the building up of Village Settlements such laws must be understood and acted upon. The psychology of the tuberculous, his instinctive craving for security and medical attention has too long been ignored by the laity and the medical profession.

After the disappointment which followed the optimism of the first few months the management of the F.N.D.B.P. is proceeding to a re-organisation of the whole scheme. The Hotel has now been officially recognised as a sanatorium. The F.N.D.B.P. has widened its outlook and has become a Society of the Tuberculous in general and not only for ex-service men.

It is as yet unknown whether this re-organisation will follow the Papworth principles completely although Clairvivre certainly offers ideal possibilities for the construction of the Papworth Scheme.

From the Papworth standpoint Clairvivre has begun at the wrong end and it would be easy to retrieve the error.

A close study of the principles underlying the Papworth Scheme must be undertaken, and with those principles as a basis for action, no better opportunity is offered than at Clairvivre for the realisation of the complete medical social and economic rehabilitation of the tuberculous.

COMPILER'S GENERAL CONCLUSIONS.

The wide application of modern forms of intensified treatment leads one to ask how far an improvement in the ultimate results can be measured up to date ; and indeed how far such an improvement may influence our policy of after-care.

A survey of follow-up statistics of sanatorium ex-patients and of patients on the dispensary register in consecutive year-groups reveals that since 1920 the mortality rate from tuberculosis has steadily decreased.

An analysis of the after-history of survivors has been made by means of a special statistical investigation on following up separately the plus-minus and plus-plus cases. A prognostic classification has been suggested for further statistical investigation of this aspect of the tuberculosis problem.

Therapy has succeeded in increasing the number of survivors and also of the arrested cases ; but in a large proportion this arrest is only conditional. Complete recovery depends mainly upon the maintenance of such conditions as enable the benefits of treatment to be retained. This is the essential consideration in planning the environment which will follow discharge from sanatoria. The more therapy succeeds in making tubercle-positive cases tubercle-negative, the more necessary it becomes to retain the recovery if the cost of prolonged and intensified therapy is not to be lost, by establishing after-care departments in sanatorium schemes.

As long as the middle group of chronic cases continues to constitute a problem, just so long must a scheme for their re-employment and after-care be regarded as a complement of the whole regime of therapy.

The restoration of working capacity for the tuberculous is supposedly the ultimate objective of all measures for care and treatment. Statistics have confirmed that the great majority of those who survive the dangers of the first years of illness must nevertheless seek their living in circumstances which have little or no regard for their physical condition.

The tuberculous working man who survives from year to year must work in order to exist, although it is well known that certain stress and strain may seriously impair the benefits of treatment. The tuberculous members of the population must be regarded as a real factor in the economic system of the nation.

Under the present system it may be shown that they constitute a very heavy charge on the budget of the community. Organised rehabilitation and re-employment are important not only for the well-being of the tuberculous worker but also for the economic well-being of the community.

The rehabilitation of the tuberculous and their incorporation in the industrial economy of the nation may be said to constitute a special problem. It demands the development of the science of estimating working capacity and its study in relation to individual physical conditions and actual working conditions. It may not be too much to say that with the increasing pace of industry, a centre for such work is becoming more and more necessary in every industrial scheme. The preliminary work that has been done shows that rough calculations are of little use in this science which is yet in its infancy.

The economic value of the sub-standard worker can only be assessed by his employment in industry where his physical and economic efficiency can be controlled by continuous clinical care. Permanent employment in sheltered conditions with such care is the first essential for a good scheme for the employment of the tuberculous.

The period of such rehabilitation should begin as "industrial convalescence." This is followed by re-employment under conditions where the benefits of therapy are consolidated rather than tested by strain.

The re-employment of the tuberculous depends upon the degree of stabilisation in general physical condition that can be attained by treatment. The recovered case may be able to achieve a degree of stabilisation which will allow return to work in normal life. The invalid however must be cared for, either in hospitals or homes where the risk of infection is minimised. Those most in need of sheltered conditions of employment are those who constitute the group known as middle cases. From their condition they are unemployable in normal industry. For such persons industrial settlements have developed as a combination of treatment and employment. It has brought into being a new type of institution, one that secures for the sub-standard worker a smooth path through all the various phases of medical, social and industrial convalescence.

Sheltered industries are most satisfactory for the re-employment of the tuberculous where an industrial plant is set up under hygienic conditions and fully mechanised. In this way the full advantage of the machine in compensating physical handicap are developed and thus even those suffering from severe disablement may be brought within the scope of a plan for re-employment.

It has been proved possible to build up such a scheme at no greater cost than relief by public assistance. Indeed the cost to the community is considerably less in infection as well as money. The care of the tuberculous is inevitably a heavy charge and the present scheme is by no means efficiently used. To add to the normal measures for the combat of tuberculosis a plan for rehabilitation and re-employment will not be so much an additional expense as a method of guaranteeing the ultimate result of costly treatment to be good.

E. BRIEGER.

Caldecote, Cambridge, August 1937.

NUMERICAL LIST OF REFERENCES.

- (1) MEACHEN, J. N.
A short History of Tuberculosis. London, John Bale and Sons, 1936, p. 20.
- (2) WEICKERT cf. Stadler, E., p. 434.
- (3) BARDSWELL, N. D.
The Consumptive Working Man. What can Sanatoria do for him? London, 1906, p. 747
- (4) POWELL, D. A.
Discussion on the problems of Prophylaxis in Pulmonary Tuberculosis. Proceedings, Royal Society of Medicine. Vol. 28, July, 1935, p. 1305.
- (5) BURNET, E.
Prophylaxie de la Tuberculose. Application en Europe. Bibliotheque de Phthisiologie publiée sous la direction de Léon Bernard. Paris, 1933, p. 62.
- (6) BERNARD, LÉON
La Cure Sanatoriale. Discussion 13. Mai. 1930.
Bull. de l'Académie de Méd. 103, 1930, p. 499.
- (7) BURNET, E., l.c., p. 12.
- (8) BURNET, E., l.c., p. 11.
- (9) BESANÇON, F.
La Cure Sanatoriale dans le Traitement de la Tuberculose Pulmonaire. Bull. de l'Académie de Méd. 4 July, 1933, Vol. 110, p. 16.
- (10) VOS, B. H.
Aftercare of the Tuberculous. Report, VIIIth Conference of the International Union against Tuberculosis, 1932, p. 455.
- (11) MACNALT, A. S.
A Report on Tuberculosis including an Examination of the Results of Sanatorium Treatment. Reports on Public Health and Medical Subjects No. 64, Ministry of Health, London, 1932. p. 90.
- (12) GOTTSTEIN, A.
Statistik der Tuberkulose. Brauer-Schröder-Blumenfeld, Handbuch der Tuberkulose, Berlin, Springer, 1921.
- (13) STOCKS, P.
Vital Statistics. In Hutt, C. W. and Thompson, H. H. Principles and Practice of Preventive Medicine, Vol. 2, p. 1561.
- (14) PEARSON, K. cf. Elderton, W. P. and Perry, S. G. (see Bibliography), p. 2.
- (15) Report to the Joint Tuberculosis Council on the Results of Artificial Pneumothorax Treatment. Tubercle, Supplement Febr. 1937, p. 20.
- (16) BENTLEY, F. J.
Artificial Pneumothorax. Experiences of the L.C.C., London, 1936. Med. Research Council Series. Special Series No. 215, p. 1.
- (17) MACNALT, A. S. l.c. (11), p. 98.
- (18) BATES, R. R.
A Follow-up Study of the Medical Students and Physician Patients discharged from Trudeau 1916-1931. Amer. Rev. Tuberculosis, Vol. 32, 2, 1935, p. 162.
- (19) GLOYNE, R. R.
From Consumption to Tuberculosis, Lancet, Nov. 1936, p. 1253.
- (20) GOTTSTEIN, A.
Allgemeine Epidemiologie der Tuberkulose, Springer, Berlin, 1931, p. 19.
- (21) LISSANT COX, G.
Tuberculosis Control in England 1935. Published by the National T'b. Association New York, 1936. p. 39.
- (22) WINGFIELD, R. C., SIR PERCIVAL HORTON SMITH HARTLEY, BURROWS, V.
The Expectation of Survival in Pulmonary Tuberculosis. Brompton Hospital Series Vol. IV, 1935. p. 21.
An Analysis of 8,766 cases treated at the Brompton Hospital Sanatorium, Frimley.
- (23) LISSANT COX, G.
Prevention and Treatment of Tuberculosis in the administrative County of Lancaster. Report of the Central Tuberculosis Officer of the Lancashire County Council for the year 1934.
- (24) BRAEUNING, H.
Welche Richtlinien ergeben sich für die weitere Tuberkulosebekämpfung aus der Mortalität und insbesondere der Morbidität der Tuberkulose. Bull. des Eidgenössischen Gesundheitsamtes, 19. Jahrg. 35, p. 1-20.
- (25) MACNALT, A. S. l.c. (11) p. 94.
- (26) SIR PERCIVAL HORTON-SMITH HARTLEY, WINGFIELD, R. C., THOMPSON, I. H. R.
An Enquiry into the After-History of Patients treated at the Brompton Hospital Sanatorium at Frimley, during the years 1905-14. Medical Research Council, London, 1924, p. 44.

- (27) BRONKHORST, W.
Clinical Treatment and After-Care. *Tubercle*, Vol. 18, 1, Oct. 1936, p. 2.
- (28) Bulletin of the International Union against Tuberculosis, Vol. 14, No. 1, Jan. 1937, p. 66-118.
- (29) BROWN LAWRASON and SAMPSON, H. L.
The Fate of the "Good Chronic" Case of Pulmonary Tuberculosis, 52nd Annual Report of the Trudeau Sanatorium p. 3. Reprinted from the Transactions of the 30th Annual Meeting of the National Tuberculosis Association, 1934.
- (30) SIR PENDRILL VARRIER-JONES.
Mitchell Lecture, Royal College of Physicians, 1927.
- (31) Fourth Report of the Employment Committee of the Joint Tuberculosis Council on Care and After-Care Schemes in Tuberculosis, 1935, p. 58.
- (32) Tuberkulosebekämpfung in der Schweiz. IV. Konferenz der Internationalen Vereinigung gegen die Tuberkulose, Lausanne, 1924, p. 79.
- (33) Gegen die Tuberkulose. Beilage zum Bulletin des eidgenössischen Gesundheitsamtes, 12. December, 1936, p. 162.
- (34) DODD, W. F.
Administration of Workman's Compensation, New York, The Commonwealth Fund, 1936.
- (35) ZADEK, I.
Unterhaltsindex ansteckender Tuberkulose. *Zeitschrift für Tuberkulose* 1, 55, 1929.
- (36) STADLER, E.
Der Einfluss der Lungentuberkulose auf Lebensdauer und Erwerbsfähigkeit und der Wert der Volkshelstätenbehandlung. *Deutsches Archiv. f. klin. Medizin.* Bd. 75, 1903, p. 422.
- (37) Annual Report London County Council. 1934, Vol. 3, 1, p. 46.
- (38) Tuberkulosebekämpfung in der Schweiz l.c. (32), p. 94-97.
- (39) WHITNEY, J. S. and MYERS, B.
Postsanatorium Histories of Sanatorium Cases. *Amer. Rev. of Tuberculosis*, Vol. 21, p. 96, 1930.
- (40) v. WEIZSAECKER
Soziale Arbeit und soziale Gesundung, Berlin, Springer, 1930.
- (41) UNGER, E.
Arbeitsunfähigkeit und Erwerbsunfähigkeit und Invalidität bei Lungentuberkulose. *Zeitschr. f. Tuberkulose* Bd. 54, p. 548, 1929.
- (42) HOLLMANN, W.
Arbeitsfähigkeit und Arbeitsunfähigkeit. *Therapie der Gegenwart* Heft 6-7, 1935, p. 5
- (43) Third Report l.c. (31), p. 3.
- (44) LEHMANN, G.
Die physiologischen Grundlagen der körperlichen Leistungsfähigkeit. *Ergebnisse der Hygiene*, 1935, p. 307.
- (45) BURHOE, B. W.
The Social Adjustment of the Tuberculous. *Nat. Tb. Association*, New York, April 1934, p. 49.
- (46) EMERSON, K.
Facts and Principles underlying a rehabilitation programme. *Transactions Nat. Tb. Assoc. U.S.A.*, 31. Ann. Meeting, June, 1935.
- (47) v. WEIZSAECKER l.c. (40).
- (48) ATZLER.
Industrial Physiology in *Encyclopedia of Occupation and Health*. Edited by the International Labour Office, Geneva, 1935.
- (49) KIDNER, TH. B.
Work for the tuberculous during and after the cure. *Arch. f. Occupational Therapy* Vol. 3, No. 3, June 1924, p. 187.
- (50) Reichsarbeitsblatt Jahrgang 1930, Heft 33, IV, p. 324. Nachfürsorge bei Lungenkranken nach erfolgreichem klinischen Abschluss des Heilverfahrens.
- (51) KESSLER, H. H.
The Crippled and the Disabled. *Rehabilitation of the physically handicapped in the U.S.A.* Columbia University Press, 1935, p. 132.
- (52) ANGROVE, P.
Rehabilitation of the Tuberculous. *Rehabilitation Revue*, Febr. 1927, p. 55.
- (53) London County Council, Annual Report 1935, Vol. 3, 1, p. 51.
- (54) MACDOUGALL, J. B.
cf. 31 p. 5
- (55) VARRIER-JONES, SIR PENDRILL
Annual Report, Papworth Village Settlement, 1934, p. 17.
- (56) VARRIER-JONES, SIR PENDRILL, l.c. 1934, p. 21.
- (57) Altro-Workshop. Special Report by E. Hochhauser.

- (58) SAWYER, W. A. and RICHARD, E. K.
The Cost of Tuberculosis to Industry, to the Individual and to the Community. *Amer. Revue of Tuberculosis*, Vol. 23, No. 4, April, 1936, p. 565.
- (59) ASCHER, V.
Ursache und Bedingungen in der Tuberkulosefrage; Volksgesundheit und Wirtschaftskrise. *Deutsche medizinische Wochenschrift*, Jahrg. 58, 52, pp. 203-6; Jahrg. 59, 9, p. 336.
- (60) BURHOE, B. W. L.c., p. 11.
- (61) BURHOE, B. W. L.c., p. 52.
- (62) Fourth Report, Employment Committee, Joint Tuberculosis Council, p. 5.
- (63) Survey of Tuberculosis Hospitals and Sanatoriums in the United States. *Tuberculosis Number of the Journal of the Amer. Med. Association*, Dec. 7th, 1935, p. 1891.
- (64) Principles of Occupational Therapy. *Occupational Therapy Association Bull. No. 4*. Printed Sheppard Hospital Press, 1923, p. 1-2.
- (65) HALL, H. J.
Presidential Address. Fifth Annual Meeting of the National Society for the Promotion of Occupational Therapy, October 1921. *Arch. Occupational Therapy*, Vol. 1, No. 2, April 1922, p. 147.
- (66) SLAGLE, A. C. cf. (65).
- (67) BURHOE, B. W. L.c. (45), p. 41.
- (68) BARDSWELL, N. D.
Lancet, Aug. 3, 1918. Quoted in Pattison, H. A.: *Agricultural and Industrial Communities for Arrested Cases of Tuberculosis and their Families*. *Bull. Federal Board for Vocational Education*, Washington, 1919, p. 32.
- (69) Annual Reports. Royal Victoria Hospital, Edinburgh.
- (70) PATTISON, H. A. and JACOBS, P. B.
Sheltered Employment for the Tuberculous. *National Tuberculosis Association 1927*, *Amer. Assoc. Revue Tuberculosis Technical Series No. 7*.
- (71) Annual Reports. Hairyres Farm Colony.
- (72) Kinson Farm Colony. cf. *Lancet* March 22, 1919.
- (73) ROUX, Campagne les Bains, special Report.
- (74) SLOANE, M. F.
Ten Years Experience with Occupational Therapy at Eudowood Sanatorium. *Nat. Soc. of Occ. Ther.*, Oct. 1921. *Arch. Vol. I and II*, 1922, p. 153.
- (75) CRANE, B. cf. Pattison and Jacobs (70).
- (76) Medical Research Committee Report, 1918. An Investigation into the Epidemiology of Phthisis in Great Britain and Ireland.
- (77) Third Report Employment Committee of the Joint Tuberculosis Council on Care and Aftercare Schemes in Tuberculosis, p. 2.
- (78) BARDSWELL, N. D.
Urban Work Centres for the Tuberculous. London, 1932.
- (79) ROLLESTON, SIR HUMPHREY
"Papworth: The Parent Village Settlement for Tuberculosis." (*Canadian Public Health Journal*, Dec. 1933). p. 558.
- (80) BURNET, E. L.c. (5), p. 102.
- (81) VOS, B. H. L.c. (10), p. 464.
- (82) VAN LIER, J. Med. Dir. of Zonnestraal. Special Report.
- (83) PATTISON, H. A., Pott's Memorial Hospital, 1936.
A review of Statistics of the first ten years.
- (84) BACHMANN, E.
Arbeitsheilstätten und Arbeitsbeschaffung für Tuberkulöse. *Schw. Zeitschr. f. Gemeinnutzigkeit*, Heft 10, Oktober 1929.
Jahresberichte der kantonalen Liga und der Arbeitsheilstätte Appisberg-Männedorf.
- (85) BRIEGER, E.
Bedeutung, Organisation und Anlage von Auslesestationen. *Zeitschr. f. d. gesamte Krankenhauswesen* 1930, H. 10, p. 274.
Invalidenhauspflege als unbefristetes Heilverfahren in der Werkstättensiedlung. *Zeitschr. f. Tuberkulose* 60, H. 5/6, 1931.
Zur Krise des Heilverfahrens bei Tuberkulose. *Deutsche med. Wochenschr.* 22, 1933, p. 854.
- (86) Umstellung der Anstaltsfürsorge. *Tuberkulose Bibliothek Nr. 33*, 1933.
Nachfürsorgesiedlung für Tuberkulöse. *Z. f. d. ges. Krankenhauswesen* 1933, 21, p. 442.
Workshop Colony for Tuberculous at Breslau. An Experiment. *Lancet*, Sept. 1930.
- (87) PAASCH, G.
Kurverlauf bei dosierter Arbeit in der Werkstättensiedlung Herrnprotsch. *Zeitschr. f. Tuberkulose* 60, H. 5/6, 1931.

- (88) POWELL, D. A. l.c. (4), p. 13.
- (89) BURHOE, B. W. l.c. (45), p. 22.
- (90) Tuberculosis—Residential Treatment—Burrow Hill Sanatorium Colony, Frimley, Surrey. Report by Medical Officer of Health, 1934.
- (91) DERSCHIED, H.
Special Report : Essai de Readaptation au travail des tuberculeuse. Bull. Int. Union, Vol XIII, No. 2, p. 175.
- (92) cf. Parodi.
- (93) Reichsarbeitsblatt l.c. (50), p. IV, 326.
- (94) Report l.c. (11), p. 112.
- (95) BARDSWELL, N. D. l.c. (78).
- (96) VARRIER-JONES, SIR PENDRILL
Annual Report Papworth Village Settlement. 1934 p. 9.
- (97) VARRIER-JONES, SIR PENDRILL
Annual Report. 1932. p. 19.
- (98) VARRIER-JONES, SIR P., l.c. (30), p. 18.
- (99) Employment Committee l.c. (31), p. 33.
- (100) MACNALT, A. S.
(Special Report.) Memorandum on Village Settlements.
- (101) VARRIER-JONES, SIR P., l.c. (31), p. 33.
- (102) Annual Reports Papworth Village Settlement 1934.
- (103) MACNALT, A. S., l.c. (11), p. 109.
- (104) BARDSWELL, N. D.
Annual Reports of the London County Council, 1932-1936, Vol. 3, 1.
- (105) BARDSWELL, N. D. l.c. (104).
- (106) MACDOUGALL, J. B. l.c. (31), p. 43.
- (107) MACDOUGALL, J. B. l.c. (31), p. 36.
- (108) SANDILAND, —,
Annual Reports, Barrowmore Hall.
- (109) Ministry of Health, l.c. (11), p. 109.
- (110) Annual Report of the London County Council 1930, Vol. 3, 1.
- (111) Annual Report of the London County Council 1935, Vol. 3, 1.
- (112) Medical Officer of Health Report 1935. County Council of Nottinghamshire.
- (113) Première Cité Sanitaire Française. Oeuvre de la Fédération des Blessés du Poumon et des Chirurgicaux Pierre Forestier Architect.
- (114) HAZEMANN, R.
La Cité Sanitaire. Revue d'Hygiène, Février, 1932.

BIBLIOGRAPHY.

- ALEXANDER, H. und ALEXANDER, H.
Arbeitsbehandlung bei Lungentuberkulose. Thieme, Leipzig, 1932.
- ANDVORD, K. F.
Ce que nous pouvons apprendre en étudiant la Tuberculose par générations. Acta Tb. Scandinavica 5, 1930, p. 137-141.
- ANGROVE, P.
Rehabilitation of the Tuberculous. Rehabilitation Review, Febr. 1927, p. 55.
- ANTHONY, —.
Untersuchungen über Lungenvolumina und Lungenventilation. Deutsches Archiv. f. klin. Med., 167, 1930.
- ASCHER, —.
Ursache und Bedingungen in der Tuberkulosefrage; Volksgesundheit während der Wirtschaftskrise. Deutsche Med. Wochenschrift, Jahrg. 58, No. 52, p. 2036; Jahrg. 59, No. 9, p. 336.
- ATZLER.
Industrial Physiology in Encyclopedia of Occupation and Health. Edited by the International Labour Office, Geneva, 1935.
- BACHMANN, E.
Arbeitsheilstätten und Arbeitsbeschaffung für Tuberkulose. Schweizer Zeitschrift für Gemeinnützigkeit, H. 10, 1929.
Wie können die in den Heilstätten erzielten Heilerfolge erhalten und verbessert werden? Schweizer Vereinigung gegen die Tuberkulose, Olten Nov. 1923.
Das Schicksal der Sanatoriumsentlassenen. Gegen die Tuberkulose, 1936, I.
The problem of post-sanatorial training in general, illustrated by a practical solution in Switzerland. Tubercle, Vol. XVII, Nr. 12, p. 532, 1936.
- BARDSWELL, N. D.
The consumptive working man. What can Sanatorium do for him? London, 1906.
The expectation of life of the consumptive after sanatorium treatment. Edinburgh, 1910.
Mortality after sanatorium treatment. Med. Research Committee, 1919.
Urban Work-Centres for the Tuberculous. London.
Aftercare of the Tuberculous in London. Tubercle Vol. 1, No. 7, p. 289, 1936.
The part played in the production of tuberculosis by infection and environmental condition. Transaction of the 19th Annual Conference Nat. Assoc. Prevention of Tuberculosis, Cardiff, 1933.
- BARNES, H. L.
End results of the employment of ex-patients in tuberculosis sanatoria. Amer. Review of Tuberculosis, Aug. 1919, p. 491.
- BATES, R. R.
A follow-up study of the medical students and physician patients discharged from Trudeau Sanatorium 1916-1931. Amer. Review of Tuberculosis, Vol. 32, 2, 1935.
- BENTLEY, F. J.
Artificial Pneumothorax. Experiences of the L.C.C., London, 1936. Med. Research Council Series. Special Series No. 215.
- BENEDICT.
Methoden zur Bestimmung des Gaswechsels. Abderhaldens Handbuch der biologischen Methoden IV, 10, 3. Urban und Schwarzenberg, Berlin, 1924.
- BENEDICT and CATHCART
Mechanical efficiency of the human body. Carnegie Institution, Washington. (1913).
- BERNARD, L.
La cure sanatoriale. Discussion 13.5.1930. Acad. de Méd. Bull. 103, 1930, p. 499.
- BESANÇON, F.
La cure sanatoriale dans le traitement de la tuberculose pulmonaire. Bull. de l'Acad., Vol. 110, 4.7.1933, p. 116.
- BISCHOFF, L.
Der Kampf gegen die Tuberkulose der U.S.S.R. Forschung und Fortschritte, Berlin, 12 Jahrg., 33.

- BOCHETTI, F.
La terapia del lavoro sanatoriale e post sanatoriale. Lotta contro le Tuberculosi. Series VI, n. 10, Ottobre 1935, XIV, p. 13.
- BRAEUNING, H.
Prognose der offenen Lungentuberkulose. Tuberkulose Bibliothek Nr. 52, 1935.
Welche Richtlinien ergeben sich für die weitere Tuberkulosebekämpfung aus der Mortalität und insbesondere der Morbidität der Tuberkulose. Gegen die Tuberkulose, 19. Jahrg 1935, p. 1-20.
Erfahrungen mit besonderen für Tuberkulose gebauten Wohnungen. Der Öffentl. Gesundheitsdienst Jahrg. 2, 17, Dez. 1936.
Prognose der offenen Lungentuberkulose. Technik der Prognosestellung und Rentabilität des Heilverfahrens Brauer. Zeitschr. f. Tuberkulose 1936, 75, p. 516.
- BRAUER, L.
Der Einfluss der krankenversorgung auf die Bekämpfung der Tuberculose. Beitr. z. ke. d. Tbc. 2, p. 88, 1904.
- BRIEGER, E.
Invalidenhauspflege als unbefristetes Heilverfahren in der Werkstättensiedlung. Zeitschr. f. Tuberkulose 60, H. 5/6, 1931.
Zur Krise des Heilverfahrens bei Tuberkulose. Deutsche med. Wochenschr. 22, 1933
Umstellung der Anstaltsfürsorge. Tuberkulose Bibliothek Nr. 33, 1933.
Nachfürsorgesiedlung für Tuberkulose. Zeitschr. f. d. gesamte Krankenhauswesen 1933, H. 21, p. 442.
Workshop Colony for tuberculosis at Breslau. An experiment. Lancet, Sept. 1930.
Zur Physiologie und Pathologie der Arbeit beim Phthisiker. Med. Klinik 47, 1928.
Die Bedeutung der Gaswechseluntersuchungen für einige Fragen der Pathologie und Therapie der Lungentuberkulose. Brauers Beiträge 63, p. 403.
Aufbau der objektiven Leistungsdiagnose. Klin. Wochenschrift Jahrg, 12, 4, 1933.
Arbeitsfähigkeit und Realwert. Eine arbeitsphysiologische Untersuchung über Beurteilung und Verwertung der dem Tuberkulösen verbleibenden Arbeitskraft. Ergebnisse der gesamten Tuberkuloseforschung Bd. 6, 1934, p. 490-580.
- BRONKHORST, W.
Das Problem der Arbeit bei Lungentuberkulose. Schweizer Jahresversammlung Olten 1930.
Die Arbeitskur als letzte Phase der Tuberkulosebehandlung. Zeitschrift für Tuberkulose 56, 1930.
Clinical treatment and aftercare. Tubercle, Vol. 18, 1, October 1936.
- BROOKE.
The after-history of sanatorium treated patients. Tubercle 9, 1928, p. 4.
- BROWN, LAWRASON and POPE, E. G.
The ultimate test of the sanatorium treatment of pulmonary Tuberculosis and its application to the results obtained in the Adirondack Cottage Sanitarium. Zeitschr. f. Tuberkulose Bd. 12, 1908, p. 206-215.
- BROWN, LAWRASON and SAMFSON, H. L.
The fate of the "good chronic" cases of pulmonary tuberculosis, 52nd Annual Report of the Trudeau Sanatorium. Reprinted from the Transactions of the 30th Annual Meeting of the Nat. Tuberculosis Association, 1934.
- BURHOE, B. W.
The social adjustment of the Tuberculous. Nat. Tub. Association, New York, April, 1934.
Importance of social diagnosis. Amer. Review 1934, 30, p. 514.
- BURNET, E.
Prophylaxie de la Tuberculose, Application en Europe. Bibliotheque de Phthisiologie publiée sous la direction de Léon Bernard, Paris, 1933.
- CHRISTENSEN, from Sayé, L.
Gold therapy in Tuberculosis. Eighth Conference of the Intern. Union against Tuberculosis. The Hague, Amsterdam, 1932.
- CLARK, SIR JAMES
A Treatise of pulmonary consumption. London, 1835.
- CORNET.
Die Tuberkulose. Nothnagels spezielle Pathologie XIV, 3. Wien 1900.
- COURCOUX, A. et Gilson.
L'effacement des images radiologique pathologique du poumon, Revue de la tuberculose. 3 Serie, 8, 1927, p. 397.
- COURTOIS, R.
Travail du tuberculeux en cure sanatoriale. Revue de la Tuberculose I, 1933, p. 9.
Tuberculeux bacillaires a capacite de travail normale. Rev. Belge Tbc. 26, 103-115.
- CRANE, B.
cf. Pattison and Jacob. Employment for the tuberculous. Amer. Assoc. Prevention of Tuberculosis, Technical Series, Nr. 7.

- CRONER.
Die Bedeutung der Lungenschwindsucht für die Lebensversicherungsgesellschaft.
I.D. Berlin, 1899.
- DECHIGI, M.
L'evoluzione del problema post-assistenziale dei tubercolotici. Lotta contre la Tuberculosis, N. 8 and 11, Aug. and Nov. 1934, XII.
- DELSUC.
Fédération des Blessés du Poumon—Vivre.
- DEIST, H.
Über das Ergebnis der Heilstättenbehandlung von Kavernenträgern. z. f. Tuberkulose 1930, H. 10.
- DODD, W.
Administration of Workmen's Compensation New York. The Commonwealth Fund, 1936.
- DROLET.
Hospitalisation in the United States. 22nd Annual Meeting of the Nat. Tb. Association, October, 1926.
- DUBLIN, L. I.
The Mortality from Tuberculosis. Metropol. Life Insurance Comp. Monogr. n. 2, p. 12.
- DOUGLAS, C. G. and PRIESTLEY, J. G.
Human physiology, Oxford, 1924.
- ELBERTON, W. P. and PERRY, S. G.
Drapers Research Memoirs. Studies on National Deterioration :—
(a) A third study of the statistics of pulmonary tuberculosis. Mortality of the tuberculous and sanatorium treatment. London, 1910.
(b) A fourth study on the statistics of pulmonary tuberculosis. The mortality of the tuberculous based on Dr. Lawrason Brown's Adirondack Sanatorium data and Dr. Austin Flint's data from pre-sanatorium days. London, 1913.
- EMERSON, K.
Facts and principles underlying a rehabilitation programme. Transactions Nat. Tuberculosis Association U.S.A. 31st. Ann. Meeting, June 1935.
- EPPINGER.
Der Einfluss körperlicher Arbeit auf den Kreislauf und auf den Stoffwechsel. (Versagen des Kreislaufes). Springer, Berlin, 1927.
- ESSELMONT, G. E.
Garden Cities for the Tuberculous. Tuberculosis Yearbook and San. Annual, p. 83, Vol. I, 1913-1914.
- FARR, W.
(a) Vital Statistics edited by Noel A. Humphreys. London, 1885.
(b) See Clark, J.
- FERRANNINI, L.
Défense des Universitaires contre la tuberculose. Assicurazioni sociali. 11, A., p. 498.
- FOUCHÉ, S.
Reports de la Ligue pour l'adaptation au travail du diminué physique.
- GLOYNE, R. R.
From consumption to tuberculosis. Lancet, Nov. 1936, p. 1253.
- GOTTSTEIN, A.
(a) Allgemeine Epidemiologie der Tuberkulose. Berlin, Springer. 1931.
(b) Statistik der Tuberkulose. Handbuch der Tuberkulose von. Brauer-Schroeder-Blumenfeld. Berlin, Springer, 1921.
- GRAFF, S.
Ein Zeitindex zur industriellen Kennzeichnung eines Falles von Lungentuberkulose. Zeitschrift für Tuberkulose 74, 1936.
- GREENWOOD, MAJOR.
The Medical Dictator, London, 1935.
- GROSS, C. R.
Postsanatorium Care, Bellevue Settlement. Amer. Review Tub. 1936, 34.
- GUINARD, U.
Avenir éloigné de la tuberculose pulmonaire chez 831 hommes cracheurs de bacilles, etc. Paris, Maloine, 1925 (cf. Burnet).
- HALDANE, J. S.
(a) Respiration. Yale Univ. Press, 1922.
(b) Second Edition: Haldane, J. S. and Priestley, J. G., Oxford, 1935.
(c) The theory of heat engines including the action of muscles. Edinburgh, 1930.
- HALL, H. J.
Presidential Address. Fifth Meeting of the National Society for the Promotion of Occupational Therapy. Arch. for Occupational Therapy, Vol. 1, No. 2, April 1922.

- HAMEL, C.
Tuberkulose-Arbeiten aus dem kaiserlichen Gesundheitsamt, Heft 11, 13, 14. Springer, Berlin, 1911 und 1918.
- HEISE, F. H.
The condition of patients discharged from the Trudeau Sanatorium 1916-1930. *Tubercle*, 1933, Vol. 15.
- HAZEMANN, R.
La post cure des Tuberculeux ; Mouvement Sanitaire 1934, Vol. 11.
La Cite Sanitaire. *Revue d'Hygiene*, Fevrier, 1932.
- HOCHHAUSER, E.
Tuberculosis—A Family Disease.
29th Annual Meeting of National Tuberculosis Association. 1933.
- HERMS and RUETTIGERS
Lungenvolumina, Ventilation und Arbeitsstoffwechsel bei Lungentuberkulose. *Brauers Beiträge* 78, p. 6.
- HILL, A. V.
Muscular movement in man and the factors governing speed and recovery from fatigue. London, 1927.
- BRADFORD HILL, A.
Principles of medical statistics, Postgraduate Series, Vol. 3, 1937.
- HOLLMANN, W.
Arbeitsfähigkeit und Arbeitsunfähigkeit. *Therapie der Gegenwart* 1935, H. 6/7, p. 5.
- HORTON-SMITH HARLEY, SIR PERCIVAL, WINGFIELD, R. C., THOMPSON, I. H.
An enquiry into the after-history of patients treated at the Brompton Hospital Sanatorium, Frimley, during the years 1905-1914. *Med. Research Council*, London, 1924.
- HUTT, C. W. and THOMPSON, H. H.
Principles and Practice of preventive medicine. London, 1935.
- JAMESON, W. H., PARKINSON, G. S. and CROWDEN, G. P.
A synopsis of hygiene. London, 1936, p. 32.
- JOHNSTONE, J.
Working colonies for the tuberculous. *Journ. Royal San. Inst.*, Sept. 1925, p. 127.
Colonies for the tuberculous. *Brit. Journ. of Tuberculosis*, July 1928, p. 113.
- KATZ, G.
Die soziale und klinische Berechtigung zum künstlichen Pneumothorax im Kampf gegen die Tuberkulose. *Tuberkulose Bibliothek* Nr. 34, Leipzig, 1929.
- KAYSER-PETERSEN, J. E.
Offene und geschlossene Lungentuberkulose. *Beitr. z. Klinik der Tuberkulose* 63, H. 4/5.
- KAYSER-PETERSEN, J. E. and RAEDER, M.
Die Bewegung der Lungentuberkulosen in Yena von 1918-1932. *Beitraege z. Klinik der Tuberkulose*, 84, 5.
- KESSLER, H. H.
The crippled and the disabled. Rehabilitation of the physically handicapped in the U.S.A. Columbia University Press, 1935.
- KEYNES, J. M. A Treatise on Probability, 1921.
- KIDNER, TH. B.
Work for the tuberculous during and after the cure. *Arch. for Occupational Therapy*, Vol. 3, No. 3, 1924.
- KING, H. M.
Contribution to the study of prognosis in tuberculosis. *Bull. of the John Hopkins Hospital*, Vol. 26, No. 309, 1916.
- KLARE, K.
Die offene Lungentuberkulose bei Kindern und Jugendlichen. 4. Jahresversammlung der Vereinigung d. Tuberkuloseärzte, Springer, 1936.
- KNIGHT, A. S. and DUBLIN, L. I.
Mortality, morbidity and working capacity of tuberculosis patients after discharge. *Association of the Life Insurance Directors of America*, Vol. 15, 1927/28.
- KNIPPING.
Die Untersuchungen über die Ökonomie der Muskelarbeit bei Gesunden und Kranken. *Zeitschr. f. experimentelle Medizin*, 66, H. 3/4.
- KOCH, R.
Epidemiologie der Tuberkulose. *Zeitschrift für Hygiene*, 1910.
- KREBS, W.
Die Fälle von Lungentuberkulose in der aargäuischen Heilstätte : Barmelweid aus den Jahren 1912-1927. *Brauers Beiträge zur Klinik der Tuberkulose* 74, H. 3/4.

- LAWRENCE, W. E.
What happens to patients discharged from tuberculosis sanatoria? Nat. Tuberculosis Association. Social Research Series No. 3, 1933.
- LEHMANN, G.
Die physiologischen Grundlagen der körperlichen Leistungsfähigkeit. Ergebnisse der Hygiene 7, 1935, p. 307.
- LEUDET.
La tuberculose pulmonaire dans les familles. Bull. de l'Académie de Médecine 1885, Vol. 2, Paris.
- VAN LIER, J.
Arbeitstherapie und Nachfürsorge bei der Behandlung Tuberkulosekranker. Zeitschr. f. Tuberkulose 55, 5, 1930.
- LISSANT COX, G.
Prevention and treatment of tuberculosis in the administrative County of Lancashire. Report of the Central Tuberculosis Officer of the Lancashire County Council for the year 1934.
Tuberculosis Control in England, 1935. Published by the Nat. Tuberculosis Association, New York, 1935.
- MACDOUGALL, J. B.
Local Authorities and Village Settlements. Lancet, March 1933, p. 560.
Training colonies and village settlements in the treatment of pulmonary tuberculosis. Lancet, June, 1924, vol. 206, p. 1343
An experiment in occupational therapy and a result. Tubercle, April, 1927, p. 301.
Schemes for the employment of tuberculous patients. Brit. Journal Tuberculosis, April, 1930.
The arrested case of tuberculosis in the Village Settlement. Brit. J. Tub. vol. 29, 1935, 216-222.
- MACNALT, A. S.
A Report on Tuberculosis including an examination of the results of sanatorium treatment. Reports on Public Health, No. 64, Ministry of Health, London, 1932.
- MARTINECK und WANKELMUTH.
Richtlinien über Gesundheitsfürsorge. Arbeit u. Gesundheit, Berlin, 1929.
- MEACHEN, J. N.
A short history of tuberculosis. John Bale and Sons, London, 1936.
- KAY MENZIES, F. N.
Training Colonies for the Tuberculous. British Journ. Tuberculosis, October, 1924, p. 133.
- MILLER, A. F.
A Study of re-admission and relapse of tuberculous patients. Amer. Review of Tuberculosis 9, 1924.
- MONCRIEFF, A.
Test for respiratory efficiency. Med. Research Council No. 198. Special Report Series, London, 1934.
- MUNCHBACH, W.
Das Schicksal der lungentuberkulösen Erwachsenen. Ergebnisse der Heilstättenbehandlung von annähernd 10,000 Männern und Frauen. Tuberkulose Bibliothek No. 42, 1933.
- NEWMAN, SIR GEORGE
Health and social evolution. Halley Stewart Lectures, 1930.
- NEWSHOLME, A.
The last thirty years in public health. London, 1936.
- OLDENBURG und SEISOFF
Gedanken über das Schicksal offentuberkulösen Eisenbahner aufgrund statistischer Erhebungen. Zeitschrift für Tuberkulose 61, H. 5, 1930.
- PAASCH, G.
Kurverlauf bei dosierter Arbeit in der Werkstättensiedlung. Zeitschr. f. Tuberkulose 60, H. 5/6, 1931.
- PEARSON, cf. Elderton and Perry.
- PARODI, F.
Al primo esperimento d'intrusione professionale nel Sanatorio di Camerlata. Como Gennaio, 1934, XII.
- PATERSON, M.
Auto-inoculation in pulmonary tuberculosis. London, 1911.

- PATTISON, H. A.
 Pott's Memorial Hospital, Livingston, Columbia, New York. A Review of Activities of the first ten years.
 Pott's Memorial Hospital, etc. *Tubercle*, October, 1936.
 Occupational Therapy and vocational guidance for the tuberculous. *Modern Medicine*, Jan. 1920, Vol. 2, No. 1, p. 1-8.
 The agricultural and industrial community for arrested cases of tuberculosis and their families. Federal Board for Vocational Education, Bull. No. 32, Washington, 1, 1919.
 Pattison and Jacobs, P. P. Sheltered employment for the tuberculous in the U.S.A. Amer. Association for the Prevention of Tuberculosis. Technical Series No. 7.
 Pattison and Niesen. *Hosp. Soc. Ser. XXI*, March, 1930.
- PHILIP, SIR ROBERT
 The efficiency of the present machinery for dealing with Tuberculosis. *The J. of State Med.* Vol. 29, No. 9, p. 265.
- POWELL, D. A.
 Discussion on the problems of prophylaxis in pulmonary tuberculosis. *Proceedings Royal Society of Medicine*, Vol. 28, July, 1935, p. 1305.
- PRINGLE, A. M. N.
 Tuberculous survivors mortality experience of the cases of pulmonary tuberculosis in Ipswich, since 1909. *British Journ. of Tuberculosis* 23, 1929, p. 4.
- ROLLESTON, SIR HUMPHREY
 Papworth: The Parent Village Settlement for Tuberculosis Canadian Public Health Journ. Dec. 1933 p. 555.
- RUETTIGERS.
 Untersuchungen über die Arbeitsökonomie bei Lungentuberkulose. *Brauers Beiträge*, 78, 1/2, 1931.
- Reports Annual: Cheshire Joint Sanatorium; Midhurst Sanatorium, King Edward VII's; Trudeau Sanatorium.
- Reports Annual of the London County Council, Lancashire County Council, Kent County Council, Durham County Council, Norfolk County Council.
- Reports of the Employment Committee of the Joint Tuberculosis Council 1926, 1930, 1935.
- Second Conference of the International Union against Tuberculosis at Brussels, 1922.
- Fourth Conference of the International Union against Tuberculosis at Lausanne, 1924. (Die Tuberkulosebekämpfung in der Schweiz).
- Eighth Conference of the International Union against Tuberculosis at the Hague-Amsterdam. 1932.
- Reichsarbeitsblatt, Jahrgang 1930, Heft 33.
- Bulletin of the International Union against Tuberculosis, July 1937.
- Report—Boston Tb. Association.
 Rehabilitation in tuberculosis, work of the technical Committee. *Second Boston M. and S. Journal*, Sept. 1926, Vol. 195, p. 567.
- Report to the London County Council, 1934, Nov.
 On Burrow-Hill Sanatorium Colony, Frimley, Surrey.
- Report—Medical Research Committee, 1918.
 An investigation into the epidemiology of Phthisis in Great Britain.
- SAWYER, W. A. and RICHARD, E. K.
 Cost of tuberculosis to industry, individual and community. *Amer. Review of Tuberculosis*, Vol. 33, 1936, p. 558.
- SAYÉ, L.
 Gold therapy in tuberculosis. Eighth Conference of the International Union against tuberculosis. Amsterdam, The Hague, 1932.
- SCHUCHARDT, A. E.
 Nachfürsorge und Berufsumleitung. *Zeitschr. f. das gesamte Krankenhauswesen* 16, 1931.
- SERGEANT, E.
 La cure sanatoriale doit rester la base fondamentale de la tuberculose pulmonaire. *Bull. de l'Académie de Méd.* Vol. 109, 30th May 1933, p. 728.
- SIEMON.
 Von der Arbeitstherapie der produktiven Tuberkulosefürsorge. *Der Öffentl.-Gesundheitsdienst*, Jahrg. 2, B., 5-10.
- SIMONSON.
 Erholung nach körperlicher Arbeit. (a) *Munchner med. Wochenschr.* 75, p. 1, 1928.

- SLAGLE, A. C.
Fifth Meeting of the National Society for the Promotion of Occupational Therapy. Arch. of Occupational Therapy, Vol. 1, No. 2, April, 1922.
- SLOAN, M. F.
Ten years experience with occupational therapy at Eudowood Sanatorium. Nat. Society for the Promotion of Occupational Therapy, Oct. 1921.
- SPIRO.
Statistische Erhebungen über die Erfolge der Lungenheilstättenkuren bei Patienten der Reichsversicherung (R.V.A.). Zeitschrift f. Tuberkulose, 52, 5.
- STADLER, E.
Der Einfluss der Lungentuberkulose auf Lebensdauer und Erwerbsfähigkeit und der Wert der Volksheilstättenbehandlung. Deutsches Arch. f. klin. Medizin, Bd. 75, 1903, p. 412.
- STAMP, SIR JOSIAH
The science of social adjustment, London 1937.
- STEWART, D. A.
Discussion. Eighth Conference of the International Union against Tuberculosis. The Hague-Amsterdam, 1932.
- STOCKS, P.
Vital Statistics. In Hutt, C. W. and Thompson, H. H. Principles and Practice of Preventive Medicine, Vol. 2, p. 1561.
- TRAIL, R. R.
Mitchell Lecture, Royal College of Physicians, 1937.
- TRUDEAU, F. B.
Use of the X-rays in pulmonary tuberculosis. J.A.M.A., Febr. 22, 1936.
- ULRICI, H.
Zur modernen Kollapsbehandlung der Lungentuberkulose. Med. Klinik 1930, H. 6.
- UNGER, E.
Arbeitsfähigkeit und Erwerbsunfähigkeit und Invalidität bei Lungentuberkulose. Zeitschr. f. Tuberkulose, Vol. 54, p. 548, 1929.
- VOS, B. H.
Aftercare of the tuberculous. Report, Eighth Conference of the International Union against Tuberculosis. The Hague, 1932, p. 455.
- VARRIER-JONES, SIR PENDRILL, cf. complete Bibliography, 1-100. Papworth Research Bulletin, Vol. 1, No. 1, 1936.
- VOUTE, —
Die Arbeitstherapie in der Tuberkulose in spezieller Berücksichtigung der Schweizer Verhältnisse. Schweizer Med. Wochenschr. 17, 1930. Zeitschr. f. Tuberkulose 65, p. 4, 1932.
- WATSON, SIR THOMAS
Lectures on the principles and practice of the phthisic. London, 1834
- WEICKERT, —. cf. Stadler, E.
- WEICKERT-PETRUSCHKY
Über Heilstätten und Tuberkulinbehandlung. Leipzig, 1901.
- V. WEIZSÄCKER
(a) Soziale Arbeit und soziale Gesundung. Springer, Berlin, 1930.
(b) Gesundheit und Krankheit. Springer, Berlin, 1933.
- WHITNEY, J. S. and MYERS, B.
Postsanatorium histories of sanatorium cases. Amer. Review of Tuberculosis, Vol. 21, p. 96, 1930.
- WINGFIELD, R. C., SIR PERCIVAL HORTON-SMITH HARTLEY, BURROWS, V. A.
The expectation of survival in pulmonary tuberculosis. Brompton Hospital Series, Vol. IV, 1935. An analysis of 8,766 cases treated at the Brompton Hospital Sanatorium, Fimley.
- WOODHEAD, SIR GERMAN SIMS, SIR CLIFFORD ALLBUTT, P. C. VARRIER-JONES
Papworth, administrative and economic problems in tuberculosis.
- WOODHEAD, SIR G. SIMS
Training in tuberculosis. British Journ. Tuberculosis 15, p. 2, 1921.
- ZADEK, I.
(a) Soziale Lage und Verlauf der Tuberkulose. Arch. Soz. Hygiene, 1930.
(b) Unterhaltsindex ansteckender Tuberkulose. Zeitschr. f. Tuberkulose 55, Jahrgang 1, 1929.
- ZINN, W.
Die Pneumothoraxbehandlung bei Lungentuberkulose, ihre Durchführung und soziale Bedeutung. Zeitschr. f. Tuberkulose 62, H. 2 u. 3.
- ZUNTZ, N. und LOEWY, A.
Lehrbuch der Physiologie, Leipzig, 1909.

PHENOL

PHENOL

Phenol is a colorless, crystalline solid with a characteristic odor. It is soluble in water and organic solvents. Phenol is used in the production of plastics, resins, and pharmaceuticals.

Phenol is a weak acid and reacts with bases to form phenoxide ions. It is also a strong oxidizing agent and can be reduced to cyclohexanol. Phenol is used in the synthesis of many organic compounds.

Phenol is a toxic substance and should be handled with care. It is a skin irritant and can cause severe burns. It is also a potential carcinogen.

Phenol is used in the production of many organic compounds, including plastics, resins, and pharmaceuticals. It is also used in the synthesis of many other organic compounds.

PHENOL

Phenol is a colorless, crystalline solid with a characteristic odor. It is soluble in water and organic solvents. Phenol is used in the production of plastics, resins, and pharmaceuticals.

Phenol is a weak acid and reacts with bases to form phenoxide ions. It is also a strong oxidizing agent and can be reduced to cyclohexanol. Phenol is used in the synthesis of many organic compounds.

